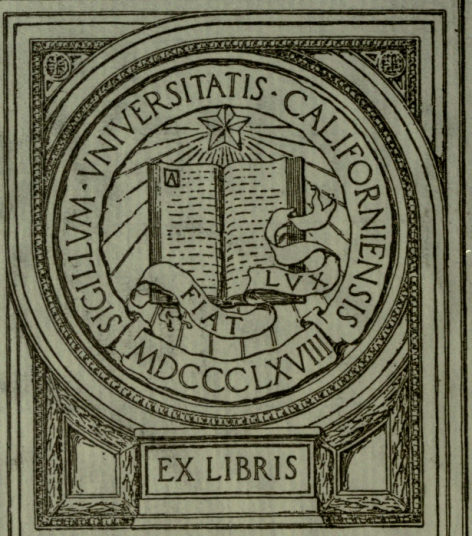
HUGHES
FREIGHT
WOODS
DANSVILLE



HOUGH'S AMERICAN WOODS.

PART VIII.

THE

AMERICAN WOODS,

EXHIBITED BY ACTUAL SPECIMENS

AND WITH COPIOUS EXPLANATORY TEXT,

BY

ROMEYN B. HOUGH, B. A.

PART VIII.

REPRESENTING TWENTY-FIVE SPECIES

BY

TWENTY-FIVE SETS OF SECTIONS.

LOWVILLE, N. Y., U. S. A.
PUBLISHED AND SECTIONS PREPARED BY THE AUTHOR.
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TO

Mr. Samuel B. Parish,

WHOSE BOTANICAL EXPLORATIONS IN SOUTHERN CALIFORNIA HAVE DONE MUCH TO ELUCIDATE ITS INTERESTING FLORA,

PART VIII, AMERICAN WOODS,

IS DEDICATED AS AN EXPRESSION OF FRIENDSHIP AND ESTEEM.

PREFACE TO THE SERIES.

The necessity of more generally diffused information concerning the variety and importance of our forest trees is justification enough for the appearance of this work, especially at this day, when the demands of Forestry in this country are constantly more and more keenly felt. The work was undertaken at the suggestion of my father, whose intense interest in Forestry, and a kindred taste, at once gave me inspiration to the work. It was entered upon with the expectation of his valuable companionship and counsel during its progress, but, alas ! that I was destined to have only at the outset, and, while I was then left ever to mourn the loss of a kind father, companion and teacher, the reader must fail to find in these pages that value and finish which his mind would have given them

Among the happiest pictures of my memory are those in which I see my father's delight, as I would show to him, from time to time, my successful progress in devising a way of making the sections for this work, and if only for the happiness which its appearance would have caused him, could he have lived until this day, I have felt duty-bound to go on with it, even though left to do it alone.

The work is the outgrowth of one, of somewhat similar plan, proposed by my father some years since, but which he did not carry into effect. Its design is primarily and principally to show, in as compact and perfect a manner as possible, authentic specimens of our American woods, both native and introduced. For that end three sections, respectively transverse, radial and tangential to the grain (see Glossary), are made of each timber, sufficiently thin to allow in a measure the transmission of light, and securely mounted in well made frames.

The three planes above mentioned show the grain from all sides, so to speak, no plane being possible but that would be either one of them or a combination of them. The difficulty, however, of cutting a great number of sections exactly on those planes is obvious, so let it be understood that the terms, "transverse," "radial" and "tangential," are, in many cases, only approximately exact in their application.

My endeavor is to show, either in a part or all of the sections standing to represent a species, both the heart and sap-wood, but with some woods

as the Sumach, for instance, where usually only the outermost ring, or a part of it, could be said to represent the sap-wood, the display of that is quite impossible. In certain other woods, as the Spruce, etc., the transition from sap to heart-wood is almost indistinguishable by any difference in color, and, although both may be shown in the sections, one can scarcely distinguish between them.

The sequence of the numbers given to the various species is of importance only to show the botanical arrangement within a given Part, each Part being independent of the others.

The text of this work has been added rather as a secondary matter, to supply to those not having it in other form, such information as is of importance, in connection with the wood specimens, to give a fairly good acquaintance with the trees represented. It contains little, if any thing, new to the botanist, but to others it is hoped it may be of some value.

In its preparation some use has been made of my father's Elements of Forestry, and thanks are due the publishers of that work — Messrs. Robert Clarke & Co. of Cincinnati, Ohio — for the use of cuts in reproducing a number of its illustrations. Other valuable books of reference have been the works of Drs. Gray, Wood and Bessey, LeMaout and Decaisne's Descriptive and Analytical Botany, Prof. C. S. Sargent's Report on the Forest Trees of North America (constituting Vol. IX, Tenth Census of the United States, 1880), Micheaux and Nuttall's North American Sylva, George B. Emerson's Trees and Shrubs of Massachusetts, D. J. Browne's Trees of America, etc.

The authenticity of the timbers represented in this work has been a subject of personal attention and special care on the part of the author. The trees selected for specimens have been identified in the field, before felling, while the leaves, flowers or fruit (one or more) have been obtainable, and he can, hence, vouch for the authenticity of every specimen represented.

Succeeding Parts, uniform in style with Part I, and representing in each case twenty-five additional species, are planned to appear later, with the ultimate end in view of representing, as nearly as possible, all of the American woods, or at least the most important, in such a series of volumes as this one.

Upon the reception which this meets in public favor, and upon the co-operation of those interested in the cause, must naturally depend the carrying out of that plan. It is hoped that greater experience and skill will enable us to obviate in future parts the faults which occur, from lack of those qualities, in this.

Notice of errors in this work will be thankfully received in hopes of profiting therefrom in the future.

LOWVILLE, N. Y., *March* 30, 1888.

PREFACE TO PART VIII.

Part VIII, American Woods, is the third installment of the woods of the Pacific slope, and in the announcement of its completion I feel a special pleasure in that I am able to show in it the interesting wood of a palm. The successful sectioning and representation of palm woods has long been an unsolved problem with me, and not until my recent experiments with the California Fan Palm have I met with any success in its solution. The result of our experiments is shown in the accompanying sections.

Another gratifying success is shown in the sections of the wood of the Cactus, *Opuntia Tuna*. This, too, is a wood which we took up hardly expecting to succeed with it. The result was a happy surprise and the sections were found to be most interesting.

The sections of the Palm and Cactus are so fragile that we have found it necessary to protect them with mica, which I trust will be sufficient, and I feel confident that their appearance in American Woods will be welcomed by our patrons with as much pleasure as we include them.

I am pleased to acknowledge gratefully the assistance rendered by Mr. Samuel B. Parish, Mr. Chas. H. Shinn, Dr. H. E. Hasse and others while gathering the woods.

For the privilege of collecting specimens of the interesting woods on Santa Catalina Island I am under obligation to Mr. J. B. Banning, and for courtesies and valuable assistance in the work to Mrs. Blanche Trask and Mr. W. S. Lyon. I wish also to acknowledge with sincere thanks the courtesies extended by Pres. C. P. Huntington, of the Southern Pacific Railroad Company, which have greatly aided me in my work.

Lowville, N. Y., *July* 31, 1899.

A KEY BASED MAINLY UPON THE FLOWERS,

Designed as an Aid in the Identification of the Species represented in Parts I to VIII, inclusive.

EXOGENOUS PLANTS — those having stems formed of bark, wood (in annual layers) and pith; cotyledons two or more.

a. **Angiospermæ** — seeds in a closed ovary.
b. *Polypetalous* — petals present and distinct.
c. Stamens numerous, more than 10, and
d. Calyx inferior — wholly free from the pistil or pistils.
e. Pistils numerous and cohering in a cone-like mass. (*Magnoliaciæ.*)
f. Anthers opening inward; leaves folded lengthwise in the bud (*Magnolia*), pointed at both ends and
g. Thick
Glaucous beneath.....51. M. GLAUCA.
Rusty tomentose beneath.....101. M. GRANDIFLORA.
*g*². Thin, green beneath.....1. M. ACUMICATA.
*f*². Anthers opening outward and leaves folded crosswise in the bud. 2. LIRIODENDRON TULIPIFERA.
*e*². Pistils more than one, separate (or nearly so); stamens inserted on Receptacle; filaments shorter than anthers (*Anonaceæ*) 76. ASIMINA TRILOBA.
Calyx-tube; filaments longer than anthers 182. LYONOTHAMNUS FLORIBUNDUS.
*e*³. Pistil solitary and
f. One-celled, style single, flowers perfect; fruit
g. A drupe with stone bony (*Prunus*) and
h. Compressed, with ridged margin; calyx-lobes glandular-serrate. 81. P. NIGRA.
*h*². Marginless; flowers in
i. Racemes
Terminal; leaves deciduous.....29. P. SEROTINA.
Axillary; leaves persistent.....156. P. ILICIFOLIA.
*i*². Corymbose umbels.....55. P. PENNSYLVANICUM.
*i*³. Umbels; leaves
Acuminate, hairy beneath.....56. P. AVIUM.
Acute, nearly smooth beneath.....82. P. CERASUS,
*g*². An achenium tipped with elongated style 130. CERCOCARPUS PARVIFOLIUS.
*f*². Compound as shown by the styles and cells of ovary: leaves
g. Punctate with pelucid dots (*Aurantiaceæ*): stamens about
20; fruit globose, flattened at end.....103. CITRUS AURANTIUM.
35; fruit globose-oblong, pointed.....104. CITRUS LIMONUM.
*g*². Not punctate.
h. Simple and calyx.
Valvate in the bud, deciduous (*Tiliaceæ*) stamens polydelphous (*Tilia*) and with 5 petal-like scales opposite the petals. 3. TILIA AMERICANA.
Imbricated in the bud, persistent; stamens at the base of petals (*Ternstrœmiaceæ*); calyx simple; stamens 5-adelphous (*Gordonia*); leaves coriaceous, evergreen.....102. G. LASIANTHUS.

*h*². Compound (*Meliaceæ*).....105. MELIA AZEDARACH.
*d*². Calyx superior (adnate) to the ovary or at least its lower half; ovary
e. 1-celled and ovules
Two in each cell; flowers dicœcious.....131. GARRYA ELLIPITICA.
Many in each cell; flowers perfect.....184. OPUNTIA TUNA.
*e*². 2-5-celled; fruit a
f. Pome with 2-5 papery carpels (*Pyrus*); leaves
g. Simple and styles
h. United below; leaves
Serrate (not lobed), downy.....30. P. MALUS.
Incisely serrate and sublobate, smooth.....83. P. CORONARIA.
*h*². Distinct.....57. P. COMMUNIS.
*g*². Pinnately compound.....84, P. SAMBUCIFOLIA.
*f*². Pome drupe-like with 1-5 bony seeds (*Cratægus*); leaves
g. Villous, cuniform, obovate.....58. C. PUNCTATA.
*g*². Glabrous, abrupt at base.....86. C. COCCINEA.
attenuate at base.....85. C. CRUS-GALLI.
*e*³. Ovary 10-celled.....59. AMELANCHIER CANADENSIS.
*c*².Stamens of the same number as the petals and opposite them; pistil one, with 2-4-celled ovary; calyx lobes
d. Obsolete; petals valvate (*Vitaceæ*).....78. VITIS ÆSTIVALIS.
*d*². Present and valvate (*Rhamnaceæ*); fruit drupe-like berry with 2-5 nutlets; calyx and disk
e. Free from the ovary (*Rhamnus*); leaves
Deciduous; fruit black at maturity.....126. R. PURSHIANA
Persistent; fruit red.....176. R. INSULARIS.
*e*². Adnate to the base of ovary (*Ceanothus*); branchlets conspicuously angled.....151. C. THYRSIFLORUS.
Slightly angled.....177. C. ABOREUS.
*c*³. Stamens few, not more than 10, alternate with the petals when of the same number.
d. Calyx inferior — free from the ovary.
e. Ovaries 2–5. separate ; styles
Terminal and connivent.....106. XANTHOXYLUM CLAVA-HERCULIS.
Lateral and distinct.....4. AILANTHUS GLANDULOSUS.
*e*². Ovary single, but compound as shown by the cells, styles and stigmas.
f. One-celled aud one-seeded ; styles or stigmas three ; shrubs or trees with regular flowers (*Anacardiaceæ*) stamens five (*Rhus*); leaves.
g. Deciduous, compound with 11–31 leaflets.....5. R. TYPHINA.
*g*². Persistent, mostly simple, thick ; fruit.
h. Viscid-pubescent
2–3 lines long ; leaves acuminate.....153. R. OVATA.
5–6 lines long ; leaves rounded at apex.....179. R. INTEGRIFOLIA.
*h*². Glabrous, small.....180. R. LAURINA.
*f*². Two to several-celled and flowers.
g. Irregular (*Aesculus*) ; fruit
Prickly.....6. AE. HIPPOCASTANUM.
Smooth.....127. AE. CALIFORNICA.
*g*². Regular ; stamens
h. As many as the petals ; trees with
i. Leaves 3-foliate.....77. PTELEA TRIFOLIATA.
*i*². Leaves simple, persistent or subpersistent.
Stamens 5.....107. CYRILLA RACEMIFLORA.
Stamens 4 ; fruit berry-like.....52. ILEX OPACA.
Stamens 10 ; leaves simple, evergreen..108. CLIFTONIA LIGUSTRINA.
*h*². From 2–5 more than the petals (*Acer*) flowers appearing
i. Before leaves in short umbels ; young fruit smooth...53. A. RUBRUM.
*i*². After the leaves, in drooping racemes.
Ovary and young fruit
Glabrous.....79. A. PENNSYLVANICUM.
Hairy.....152. A. MACROPHYLLUM.
*e*³. Ovary single and simple, with one parietal placenta (*Leguminosæ*) ; corolla

f. Papilionaceous; stamens
Distinct.. .....80. ROBINIA PSEUDACACIA.
Monadelphous; leaves glandular-dotted... .....154. DALEA SPINOSA.
f^2. Subregular and imbricated in aestivation; flowers
g. Perfect (*Circidium*) ..... 128. C. TORREYANUM.
g^2. Dioecious; stamens 10; tree unarmed. .27. GYMNOCLADUS CANADENSIS.
g^3. Polygamous; stamens 5; tree armed with usually triple thorns (*Gleditschia*) pods
Linear, many-seeded.... .....28. GLEDITSCHIA TRIACANTHOS.
Obliquely ovate, 1-seeded..... ...109. GLEDITSCHIA MONOSPERMA.
f^3. Regular, stamens
Ten; petals distinct (*Prosopis*) .....129. P. JULIFLORA.
Indefinitely numerous; petals united below (*Acacia*) 155. A. MELANOXYLON.
d^2. Calyx superior — adnate to the ovary; stamens
e. 4; styles and stigmas 1 (*Cornaceæ*) flower cluster
f. Enveloped with petal like involucral scales which envelope the head while dormant and when developed are notched at apex 88. C. FLORIDA.
Subtend the head and when developed are acute at apex 185. C. NUTTALLII.
f^2. Without petal-like involucral scales; flowers in cymes 87. C. ALTERNIFOLIA.
e^2. 5; styles 5; fruit a 5-seeded drupe-like berry.....8. ARALIA SPINOSA.
d^3. Calyx adnate to the lower half of ovary only, but closely enveloping the hairy upper half in fruit..... ...181. HETEROMELES ARBUTIFOLIA.
b^2. *Gamopetalous* — petals present and united; stamens
c. As many as the lobes of the corolla which is
d. Irregular; ovary 2-celled (*Bignoniaceæ*); leaves simple and
Broadly-ovate (*Catalpa*) .....89. C. BIGNONIOIDES.
Linear (*Chilopsis*). .....134. C. SALIGNA.
d^2. Regular; stamens 5; leaves
Pinnately compound (*Sambucus*) and glaucous.....157. S. GLAUCA.
Simple, glaucous ....188. NICOTIANA GLAUCA.
c^2. Fewer than the lobes of the corolla — 1 or 2; fruit drupaceous and
Oily; corolla-lobes valvate .....186. OLEA EUROPEA.
Dry; corolla-lobes imbricated .....112. OSMANTHUS AMERICANUS.
c^3. More numerous than the lobes of the corolla
d. Distinct and free from it (*Ericaceæ*); fruit
Fleshy and ovary
5-celled, several ovules in each cell.....132. ARBUTUS MENZIESII.
5-10-celled, single ovule in each cell...133. ARCTOSTAPHYLOS PUNGENS.
Dry, capsule septicidal (*Rhododendron*).....138. R. CALIFORNICUM.
d^2. Inserted on its base and filaments distinct.....61. DIOSPYROS VIRGINIANA.
b^3. *Apetalous* — without petals.
c. Flowers not in catkins; pistil one, simple or compound, and the cells of the ovary containing 1-2 seeds each.
d. Ovary inferior — adnate its whole length to the calyx-tube — and
e. 1-celled and 1-seeded; style stigmatic down the side (*Nyssa*): fertile peduncles 2-5-flowered.....9. N. MULTIFLORA.
Single-flowered and short and downy.....110. N. OGECHE.
e^2. Several-celled; calyx opening by a dehiscent lid (*Eucalyptus*); capsules axillary, top shaped..... ....183. E. GLOBULUS.
d^2. Ovary superior — free from the calyx.
e. Stipules sheathing the stem; trees with naked monœcious flowers arranged in heads, which are
Solitary. ....13. PLATANUS OCCIDENTALIS.
2-7 together in a moniliform spike.....135. PLATANUS RACEMOSA.
e^2. Stipules not sheathing the stem or none.
f. Ovules a pair in each cell of the ovary, which becomes in fruit a
g. Double samara (*Acer*)
h. Leaves simple and palmately veined: flowers appearing
i. With the leaves in pendulous corymbs.....7. A. SACCHARINUM.

*i*². Before the leaves in short umbels; young fruit wooly 26. A. DASYCARPUM.
*h*². Leaves compound ..... 54. A. NEGUNDO.
*g*². Single 1-celled and 1-seeded samara (*Fraxinus*), which is
h. Terete at base; lateral leaflets
i. Petiolulate and new growth
Smooth..... 10. F. AMERICANA.
Pubescent..... 31. F. PUBESCENS.
*i*². Sessile or nearly so; leaves tomentose ..... 167. F. OREGONA.
*b*². Broad at base..... 62. F. SAMBUCIFOLIA.
*g*³. Capsule 3-celled each cell with a single seed....189. RICINUS COMMUNIS.
*f*². Ovules single in each of the 1 or 2 cells of the ovary.
g. Anthers opening by uplifted valves; stigma single and entire (*Lauraceæ*); flowers
h. Perfect; leaves evergreen; calyx lobes
Persistent (*Persea*)..... 113. P. CAROLINENSIS.
Deciduous (*Umbellularia*)..... 159. U. CALIFORNICA.
*h*². Dioecious, calyx deciduous, leaves deciduous; involucre none (*Sassafras*)..... 32. S. OFFICINALE.
g.² Anthers extrorse; stigma 2-cleft; fruit a
h. Samara, 1-celled and winged all round (*Ulmus*).
i. Flowers nearly sessile; samara not ciliate-fringed; leaves very rough above..... 11. U. FULVA.
*i*². Flowers on drooping pedicels; samara ciliate-fringed; leaves smooth.
Bud-scales glabrous; flowers fascicled; branches not corky-winged 33. U. AMERICANA.
Bud-scales downy ciliate; flowers racemed; branches corky-winged 34. U. RACEMOSA.
*h*². Capsule, dry, nut-like, not winged (*Planera*).....114. P. AQUATICA.
*g*³. Anthers introrse; fruit a dark-purple drupe, leaves long-taper-pointed 12. CELTIS OCCIDENTALIS.
*g*⁴. Anthers laterally dehiscent; fruit a drupe. 111. FORESTIERA ACUMINATA.
*c*². One or both sorts of flowers in catkins, diclinous.
d. Only one sort (the staminate flowers) in catkins.
e. Fertile flowers single or clustered; fruit naked; leaves pinnately compound (*Juglandaceæ*).
f. Corolla present in the fertile flowers; fruit with valveless epicarp (*Juglans*).
g. Fruit ovoid-oblong and viscid-hairy..... 14. J. CINEREA.
*g*². Fruit subglobose
1½ in. or more in thickness, roughly dotted..... 35. J. NIGRA.
1¼ in. or less in thickness, pubescent. .....190. J. CALIFORNICA.
*f*². Corolla not present in the fertile flower; fruit with usually 4-valved epicarp (*Carya*) which is
g. Thick; valves separating to base; bark
h. In loose plates; leaflets
5, smoothish; nut small.....36. C. ALBA.
7–9; nut large..... 64. C. SULCATA.
*h*². Close, leaflets 7-9, tomentose..... 90. C. TOMENTOSA.
*g*². Thin; bark close; nut
h. Quite smooth, small, thin-shelled, leaflets
5-7; kernel edible ..... 91. C. MICROCARPA.
7-9; kernel very bitter..... 37. C. AMARA.
*h*². More ridged, larger, thicker-shelled; leaflets 5-9.....65. C. PORCINA.
*h*³. Rugose, angular; leaflets 11-13.....115. C. AQUATICA.
*e*². Fertile flowers 1–3 together, invested wholly or partly with an involucral covering; leaves simple (*Cupuliferæ*).
f. Involucre valveless, cup-like, composed of many scales and only partly inclosing the one nut, *i. e.*, acorn (*Quercus*); staminate aments
g. Pendulous (section *Lepidobalanus*); stigmas
h. Sessile or nearly so and dilated; stamens 6-8; abortive ovules mostly basal (subsec. *Leucobalanus*, WHITE OAKS); maturation

i. Annual; nut glabrous inside; abortive ovules basal;
j. Leaves falling in autumn,
k. Sinuate-pinnatifid.
l. Obovate-oblong, pale below and with
m. Narrow oblique lobes.....38. Q. ALBA.
*m*². Wide lobes, less oblique and margin of lobes
Undulate-toothed.....160. Q. LOBATA.
Entire or nearly so.....136. Q. GARRYANA.
*l*². Obovate with deep sinuses and the central pair of lobes usually wide and spreading.....93. Q. OBTUSILOBA.
k. Lyrate-pinnatifid; nut ½ or more immersed.
Peduncles shorter than petioles.....39. Q. MACROCARPA
Peduncles longer than petioles.....66. Q, BICOLOR.
*k*³. Coarsely undulate-crenate-toothed (CHESTNUT OAKS)
l. Obovate-oblong with mostly rounded teeth;
Acorn less than 1-in. long.....67. Q. PRINUS.
Acorn more than 1-in. long.....116. Q. MICHAUXII.
*l*². Lanceolate to oblong, sharply undulate-toothed
68. Q. MUHLENBERGII.
*j*². Persistent, dark green, elliptical or oblong and entire or remotely spinose-dentate.....117. Q. VIRENS.
*i*². Biennial; nut tomentose inside; abortive ovules basal or lateral; leaves persistent, both entire and undulately spinose-dentate.
Oblong, finally glabrous beneath.....161. Q. CHRYSOLEPIS.
Oblong-lanceolate, tomentose beneath.....191. Q. TOMENTELLA.
*h*². Styles elongated; stamens 4–6; abortive ovules superior (subsection *Melanobalanus* BLACK OAKS).
i. Maturation annual; leaves persistent, orbicular-oblong, sinuately spinous-toothed or entire.....138. Q. AGRIFOLIA.
*i*². Maturation usually biennial; leaves
j. Deciduous and with teeth and lobes acute and bristlepointed; leaves
k. Moderately pinnatifid
Cup very shallow, ¼ covering the nut; scales fine..15. Q. RUBRA.
Cup deeper, ½ covering the nut; scales large.
162. Q. CALIFORNICA.
*k*². Deeply pinnatifid; lobes
l. Rather broad; inner bark yellowish.....93. Q. TINCTORIA.
*l*². Narrow; sinuses broad and rounded; acorn
Ovoid-oblong, ½ invested in a coarse-scaled cup.
69. Q. COCCINEA.
Flattened-globular, ¼ invested in fine-scaled cup.
94. Q. PALUSTRIS.
*j*². Subdeciduous — part persisting and green throughout the winter — obovate-spatulate glabrous.....118. Q. AQUATICA.
*j*³. Persistent, oblong-lanceolate.....192. Q. WISLIZENI.
*g*². Erect, with pistillate flowers at their bases; stigmas linear; leaves persistent (section *Pasania*).....50. Q. DENSIFLORA.
*f*². Involucre 2-4-valved, becoming hard and prickly and inclosing 1-3 sweet, edible, flattened, subglobose nuts; sterile flowers in catkins; leaves
Deciduous.....40. CASTANEA VESCA.
Evergreen.....139. CASTANOPSIS CHRYSOPHYLLA.
*f*³. Involucre 4-valved and inclosing two 3-cornered edible nuts.
16. FAGUS FERRUGINEA.
*e*³. Fertile flowers in short catkins; nuts small and achenium-like; sterile flowers destitute of calyx; leaves simple.
f. Nutlet inclosed in a bladder-like bag.....41 OSTYRA VIRGINICA.
*f*². Nutlet not inclosed but subtended by an enlarged leafy bract.
42. CARPINUS CAROLINIANA.
*d*². Both staminate and pistillate flowers in catkins.
e. Ovary and pod 2-celled, many-seeded...60. LIQUIDAMBAR STYRACIFLUA.
*e*². Ovary 1-2-celled with a single ovule in each cell; calyx of fertile flower

f. Not becoming succulent in fruit; fertile flowers
g. Two-three at each scale of the catkin; calyx
h. Very irregularly 4-lobed, stamens 2; scales of cone thin and deciduous (*Betula*); bark
i. Brown and close, catkins erect.....44. B. LENTA.
*i*². Yellowish-gray and ragged, catkins sub-erect.....17. B. LUTEA.
*i*³. White, and leaves
Deltoid, smooth both sides.....70. B. POPULIFOLIA.
Ovate, hairy on veins beneath.....43. B. PAPYRACEA.
*i*⁴. Reddish-brown, shaggy.....95. B. NIGRA.
*h*². Four-parted; stamens usually 4; fertile scales thick, woody and persistent (*Alnus*).....163. A. RHOMBIFOLIA.
*g*². Single at each scale of the catkin (*Myricaceæ*); flowers monoecious.....164. MYRICA CALIFORNICA.
*f*². Becoming succulent in the fruit.....63. MORUS RUBRA.
*e*³. Ovary 1-celled and many-seeded, the seeds at maturity furnished with a hairy tuft (*Salicaceæ*).
f. Bracts of the catkins entire; calyx wanting; stamens 2-7 (*Salix*); catkins
g. Terminating leafy branchlets; stamens 3 or more; scales of the pistillate aments falling before the ripening of the fruit; leaves
Narrow-lanceolate, often falcate, green above and below and glabrous. 45. S. NIGRA.
Ovate-lanceolate to lanceolate. pale and glaucous beneath. 71. S. AMYGDALOIDES.
Oblong-lanceolate to lanceolate, blue-green above pale glaucous beneath.....140. S. LAEVIGATA
Lanceolate, silky white both sides, glabrous above when old, stamens 2.....46. S. ALBA VAR VITELLINA.
*g*². Sessile or nearly so and peduncles mostly leafless; scales persistent under the fruit; leaves
Oblanceolate to oblong-lanceolate, dark green above paler and puberulous beneath.....165. S. LASIOLEPIS.
Oblong-obovate, yellowish green above.....193. S. NUTTALLII.
*f*². Bracts of the catkins lacerately fringed; calyx a disk-like cup; stamens 8–30, leaves broad (*Populus*); styles with
g. Narrow lobes; capsule small; seeds minute, petioles laterally compressed; leaves
h. Cordate-orbicular, finely serrate.....72. P. TREMULOIDES.
*h*². Ovate-orbicular, coarsely dentate, beneath
Glabrous at maturity.....18. POPULUS GRANDIDENTATA.
Densely tomentose at maturity.....96. POPULUS ALBA.
*h*³. Deltoid; branchlets terete.....73. P. DILATATA.
*g*². Broad lobes; capsules large; seeds 1 line or more in length and leaves
Ovate-lanceolate, smooth, strongly reticulated and whitish beneath, 47. P. BALSARIFERA.
Broad-ovate, obtuse at apex, tomentose at least along the veins beneath. 97. P. HETEROPHYLLA.
Broad-deltoid, with laterally compressed petioles and generally
Ten or more pairs of large crenate-serrate teeth....48. P. MONILIFEA.
Less than ten pairs.....194. P. FREMONTII.
*a*². **Gymnospermæ**—seeds naked, borne superficially on carpellary scales; cone-bearing (*Coniferæ*); scales
b. Many, imbricated, each in the axil of a bract and bearing 2 inverted ovules; seeds winged.
c. Leaves evergreen, fascicled; cones maturing the second year (*Pinus*).
d. Leaves in 2s; cones with scales
e. Smooth (awnless); leaves
5–6 in. long, with long sheaths.....19. P. RESINOSA.
1 in. or thereabouts in length, sheaths short.....99. P. BANKSIANA.
*e*². Armed with a prickle; leaves
f. 1½–2½ in. long; cones 1–3 in.

Very oblique, branchlets brown and rough.....148. P. CONTORTA.
Not oblique, branchlets purple, quite smooth.....98. P. INOPS.
*f*². 2–3 in. long; cone 2–2½ in. long.....122. P. CLAUSA.
*f*³. 3–5 in. long, sheaths elongated, cones
g. Scarcely 2 in. in length, solitary or in pairs and slightly if at all oblique; branchlets
Rough; prickle inclined nearly at right angle to the axis of cone when closed.....75. P. MITIS.
Smooth; prickle inclined more towards the apex of the cone. 123. P. GLABRA.
*g*². 2–3½ in. long, mostly in umbels, very oblique.....170. P. MURICATA.
*d*². Leaves in 3s and scales of cone thickened at apex and
e. Armed with a prickle or spur; leaves
f. 3–6 in. long, cone about 2 in. long; prickles strong.....50. P. RIGIDA
*f*¹. 5–8 in. long; cone 2–3 in; prickles weak.....121. P. SEROTINA.
*f*². 7–10 in. long, stout; cone 3–5 in. long, sessile.....147. P. PONDEROSA.
*f*³. 8–15 in. long; cones
4–8 in. long, oval, lateral long-stalked.....198. P. SABINIANA.
6–10 in. long, subterminal, slightly if at all oblique. 124. P. PALUSTRIS.
10–15 in. long, lateral, very oblique and heavy.....169. P. COULTERI.
*e*². Unarmed at maturity, very oblique and scales very gibbous outside near the base.....199. P. RADIATA.
*d*³. Leaves in 5s; scales of cones
e. Thin and unarmed
4–6 in. long.....49. P. STROBUS.
12–18 in. long.....146. P. LAMBERTIANA.
*e*². Thick and armed with a thick spur.....197. P. TORREYANA.
*d*⁴. Leaves in both 2s and 3s, 7–12 in. long; cone 3–6 in. long, glossy brown. 125. P. CUBENSIS.
*c*². Leaves evergreen, scattered (not fascicled); cones with
d. Thick scales, maturing the second year.....196. P. MONOPYLLA.
*d*². Thin scales, maturing the first year.
e. Cones erect; cylindrical; leaves mostly flat, linear (*Abies*.)
f. Cones 3–4 or 5 in. long; leaves
Scarcely 1 in. long.....22. A. BALSMEA.
2 in. or more in length.....173. A. CONCOLOR.
*f*². Cones 6 or 8 in. long; leaves quadrangular.....174. A. MAGNIFICA
*e*². Cones pendent.
f. Bracts inconspicuous, leaves
g. Petiolate and generally flat and linear (*Tsuga*); cones
Small, ¾ in. or less in length, leaves 2-ranked.....21. T. CANADENSIS.
Larger, 2–3 long; leaves scattered.....171. T. PATTONIANA.
*g*². Sessile; leaves 4-angled (*Picea*)
1–1½ in. long, ovate, scales eroded at tip, branchlets pubesent. 20. PICEA NIGRA.
2 in. long, cylindrical-ovoid, entire at tip, branchlets smooth 100. PICEA ALBA.
1½–3 in. long, cylindrical, scales elongated and incisely denticulate at tip.....149. PICEA SITCHENSIS.
*f*². Bracts conspicuously exserted (*Pseudotsuga*); cone
2–3 in. long.....150. P. TAXIFOLIA.
5–8 in. long.....172. P. MACROCARPA.
*c*³. Leaves deciduous, soft, needle-shaped and in fascicles of many each; cones about 8 lines in length, scales thin (*Larix*) and with inflected margins 23. L. AMERICANA.
*b*². Few,
c. Imbricated, without bracts and each bearing two erect ovules; flowers
d. Monœcious, scales thinnish and 8–12 (*Thuya*).....24. T. OCCIDENTALIS.
*d*². Dicœcious, scales fleshy and consolidated making a dark blue berry-like fruit (*Juniperus*) which is
Large (about ½ in.), reddish-brown with sweet fibrous flesh; seeds 1 or 2. 167. J. CALIFORNICA.

Smaller, bluish, with resinous flesh, leaves
Ternate, ciliate-denticulate, seeds 2–3.....168. J. OCCIDENTALIS.
Binate, entire, seed 1–4.....25. J. VIRGINIANUS.
*c*². Valvate, thick and only one pair fertile.....141. LIBOCEDRUS DECURRENS.
*c*³. Peltate, with edges joined, cones
d. Subglobose; flowers monœcious; cones dehiscent
e. Along the edges of the persistent scales,
Small, ⅓ in. in diameter, maturing 1st year (*Chamæcyparis*)
74. C. THYOIDES.
Larger, maturing the second year (*Cupressus*)
½ to nearly 1 in. long; branchlets slender.....66. C. GOVENIANA.
1 to 1½ in. long; branchlets stout.....195. C. MACROCARPA.
*e*². Scales breaking apart irregularly and 15–20 in number.
119. TAXODIUM DISTICHUM.
*d*³. Ovoid-oblong, scales diverging at right angles to axis and rhomboidal at apex; cones
2–3 in. long.....142. SEQUOIA GIGANTEA.
1 in. or less.....143. SEQUOIA SEMPERVIRENS.
*b*³. Differentiated into a fleshy covering or cup, with single erect seed.
c. With fleshy covering (drupe-like), sessile and
1 in. or slightly more long.....120. TORREYA TAXIFOLIA.
About 1½ in. long.....145. TORREYA CALIFORNICA.
*c*². Subtended by a red fleshy cup.....144. TAXUS BREVIFOLIA.

ENDOGENOUS PLANTS — those having stems in which the wood forms in wire-like bundles, generally a single cotyledon and leaves parallel veined; ovary superior; perianth corolla-like; flowers
Not on a spadix; ovules 2 or more (*Liliaceæ*).
175. YUCCA ARBORESCENS.
On a spadix; ovules solitary (*Palmæ*); leaves flabellate, filiferous and allumen entire (*Washingtonia*).
200. W. FILAMENTOSA.

A KEY BASED UPON THE LEAVES,

Designed as an Aid in identifying the Species represented in Parts I to VIII inclusive, when out of Season for procuring the Flowers.

N. B.— As this key applies only to the species thus far represented in AMERICAN WOODS it is important always to confirm identification by applying the more detailed description given in its proper place.

a. **Deciduous Leaves.** — falling in autumn.
b. *Simple Leaves.*
c. Laminate — with well marked blade and petiole.
d. Main rib single — pinnately veined.
e. Entire or nearly so, pointed at both ends and
f. Opposite
3–5 in. long, thick, lustrous above..... 9. NYSSA MULTIFLORA.
5–6 in. long, thin, dull above.....89. CATALPA BIGNONIOIDES.
f^2. Alternate, and
g. Large, thinnish
Oblong, 5–10 in. long, petioles 1–2 in.
1. MAGNOLIA ACUMINATA.
Obovate-lanceolate, 6–12 in. long, petiole scarcely ½ in.
76. ASIMINA TRILOBA.
g^2. Smaller, 2–7 in.,
Thickish, and with light-colored pubescence, at least on the veins beneath.
Petioles about 1 in. long.....61. DIOSPYROS VIRGINIANA.
Petioles about ¼ inch long.....110. NYSSA OGECHE.
Thinnish, oblong-obovate (often remotely serrate).
193. SALIX NUTTALLII.
f^3. Alternate, opposite and scattered upon the same plant, linear.
134. CHILOPSIS SALIGNA.
e^2. Serrate, serulate or dentate.
f. Inequilateral and cordate or truncate at base,
g. Ovate-orbicular, large, 4–5 in. or more in length.
3. TILIA AMERICANA.
g^2. Ovate, long-taper-pointed from a broad base.
12. CELTIS OCCIDENTALIS.
g^3. Ovate-oblong and
h. Very rough, especially above, rugose .....11. ULMUS FULVA.
h^2. Smoothish and
i. 2–4 in. long, fruit in
Fascicles..... 33. ULMUS AMERICANA.
Racemes ..... 34. ULMUS RACEMOSA
i^2. 1–2 in. long and only slightly inequilateral.
114. PLANERA AQUATICA.
Flowers and fruit in fascicles.....33. ULMUS AMERICANA.
Flowers and fruit in racemes..... .....34. ULMUS RACEMOSA
f^2. Equilateral and obtuse, rounded or cordated at base.
g. Veins straight or nearly so, leaves thinnish.

h. Ovate-oblong.
Coarsely serrate with remote teeth, one at the end of each vein, ciliate and covered with silky white hairs.
16. FAGUS FERRUGINEA.
Doubly and sharply serrate, nutlet inclosed in a papery sac.
41. OSTRYA VIRGINICA.
Unequally and sharply serrate, nutlet subtended by a leafy bract.
42. CARPINUS CAROLINIANA.
*h*². Ovate and
i. Finely and closely serrate, smooth, whitish and reticulate-veined beneath . . . . . 47. POPULUS BALSAMIFERA.
*i*². Doubly serrate and
j. Thinnish; petioles downy and of aromatic flavor.
Bark of trunk yellowish-gray. . . . . 17. BETULA LUTEA.
Bark reddish-brown. . . . . 44. BETULA LENTA.
*j*². Thickish and bark white. . . . . 43. BETULA PAPYRACEA.
*g*². Veins incurved; leaves
h. Orbicular-heart-shaped, thickish, 4–8 in. long.
Acuminate. . . . . 63. MORUS RUBRA.
Obtuse or rounded at apex. . . . . 97. POPULUS HETEROPHYLLA.
*h*². Orbicular-ovate; petioles laterally compressed; leaves
Coarsely dentate. . . . . 18. POPULUS GRANDIDENTATA.
Serrate-dentate. . . . . 72. POPULUS TREMULOIDES.
*h*³. Elliptical to obovate, conspicuously netted-veined.
126. RHAMNUS PURSHIANA.
*f*³. Equilateral and acute at base, tapering both ways,
g. Narrow-lanceolate, very long-attenuate, tomentose on midrib above and petiole . . . . . 45. SALIX NIGRA.
*g*². Ovate-lanceolate to lanceolate, long-acuminate, 2–4 in. long; capsules
Sessile or nearly so . . . . . 46. SALIX ALBA var. VITELLINA.
With slender pedicels . . . . . 71. SALIX AMYGDALOIDES.
*g*³. Oblong-lanceolate to lanceolate.
h. Minutely serrulate, 3-7 in. long; petioles downy.
140. SALIX LAEVIGATA.
*h*². Serrate with teeth sharply
Awn-pointed and in about 20 pairs. . . . . 40. CASTANEA VESCA.
Mucronate and in 6-12 pairs. . . . . 68. QUERCUS MUHLENBERGII.
Finely glandular-serrate. . . . . 55. PRUNUS PENNSYLVANICA.
*g*⁴. Oblanceolate to lanceolate-oblong, puberulous beneath.
165. SALIX LASIOLEPIS.
*g*⁵. Obovate-oblong, serrate, hairy under surface. . . . . 56. PRUNUS AVIUM.
*g*⁶. Ovate; petioles short, generally not more than ½ in.
163. ALNUS RHOMBIFOLIA.
Long, very smooth and shining above. . . . . 57. PYRUS COMMUNIS.
*g*⁷. Wedge-obovate, veins very prominent,
Thin, smoothish and dull above. . . . . 58. CRATAEGUS PUNCTATA.
Thick, smooth and lustrous above. . . . . 85. CRATAEGUS CRUS-GALLI.
*g*⁸. Ovate-oblong, veins incurved and petioles
h. With 2–4 glands, smooth. . . . . 29. PRUNUS SEROTINA.
*h*². Without glands,
Glabrous both sides, sharply serrate.
59. AMELANCHIER CANADENSIS.
Downy under-side and petiole. . . . . 30. PYRUS MALUS.
*g*⁸. Lanceolate oblong, 1–3 in. long, about equally acuminate at both ends.
111. FORESTIERA ACUMINATA.
*f*⁴. Equilateral and truncate at base,
g. Serrate-dentate with cartilaginous teeth
Deltoid-ovate, rather long taper-pointed. . . . 48. POPULUS MONILIFERA.
Deltoid-reniform, more abruptly pointed. . . 194. POPULUS FREMONTII.
Broadly deltoid. . . . . 73. POPULUS DILATATA.
*g*². Irregularly serrate or obscurely lobed. . . . . 70. BETULA POPULIFOLIA.
*e*³. Pinnately lobed; lobes
f. Rounded at apex (not bristle-pointed) and

g. Subequal, sinuses
Wide, lobes narrow and nearly entire; leaves 5–9 in. long.
38. QUERCUS ALBA.
Narrow, lobes wide and
mostly undulate or crenate-toothed; leaves 2–3 in. long.
160. Q. LOBATA.
Entire or nearly so and round or obtuse at apex.
136. Q. GARRYANA.
*g*². Very unequal,
h. The two lobes nearest the summit much the largest.
92. QUERCUS OBTUSILOBA.
*h*². Lyrate-pinnatifid and sinuses extending
Nearly to the midrib and roundish.....39. QUERCUS MACROCARPA.
Usually not over half-way to the midrib and more acute.
66. Q. BICOLOR.
*f*². Bristle-pointed; sinuses
g. Moderately deep and narrow;
Lobes narrowing towards apex and mostly terminating in 1–3 bristle-pointed teeth..... 15. Q. RUBRA.
Lobes generally widening towards apex and terminating in 3–7 bristle-pointed teeth.....162. Q. CALIFORNICA.
*g*². Deeper and broader; lobes narrower.....93. Q. TINCTORIA.
*g*¹. Deep, broad and rounded; lobes very narrow; acorn
Ovoid-oblong, ½ immersed in a coarse-scaled cup.
69. QUERCUS COCCINEA.
Flattened-globular, ¼ immersed in a fine-scaled cup.
94. QUERCUS PALUSTRIS.
*e*⁴. Broad, truncate at both base and apex, and with two spreading lobes on on each side.....2. LIRIODENDRON TULIPIFERA.
*e*⁵. Wavy and spinous-toothed, very thick.....52. ILEX OPACA.
*e*⁶ Undulately crenate-toothed; obovate-oblong,
Slightly if at all pubescent beneath .....67. QUERCUS PRINUS.
Velvety pubescent beneath... .....116. QUERCUS MICHAUXII.
*e*⁷. Sinuate-toothed, white-tomentose beneath..... 96. POPULUS ALBA,
*e*⁸. Cut-serrate or sublobate with slender petioles;
Ovate, coarsely cut-serrate.....83. PYRUS CORONARIA.
Round-ovate, finely cut-serrate .....86. CRATÆGUS COCCINEA.
*e*⁹. Crenate-serrate; petioles 1 in. or slightly less in length.
82. PRUNUS CERASUS.
*e*¹⁰. Obscurely crenulate-toothed; leaves
Alternate, petioles long, mostly 1½ in. or more.
87. CORNUS ALTERNIFOLIA.
Opposite, petioles short (less than 1 in.); involucral scales when fully developed.
Obcordate ..... 88. CORNUS FLORIDA.
Pointed at apex.....185. CORNUS NUTTALII.
*e*¹¹. Undulate-serrate, ½–¾ in. long and bearing large scattered glands.
154. DALEA SPINOSA.
*e*¹². Doubly crenate-serrate with glandular teeth .....81. PRUNUS NIGRA.
*e*¹³. Doubly serrate, rhombic-ovate .....95. BETULA NIGRA.
*d*². Main ribs several, palmately-veined, etc.
e. Rib single at first but soon sending off a strong vein on each side and leaves 3-lobed, 2-lobed or entire.....32. SASSAFRAS OFFICINALE.
*e*². Ribs three at first, but soon five or more by branching, leaves alternate, base of petiole concave and fitting over the axillary bud, obscurely 3–5 lobed with broad shallow sinuses.....13. PLATANUS OCCIDENTALIS.
5-lobed with narrow and deeper sinuses....135. PLATANUS RACEMOSA.
*e*³. Ribs 5–7 from commencement; leaves
f. Opposite, base of petiole subtending (not covering) the axillary bud.
g. Moderately incised with broad lobes which are
Sparingly sinuate-toothed.....7. ACER SACCHARINUM, WANG.
Irregularly serrate and notched .....53. ACER RUBRUM.
Sharply and finely doubly serrate.....79. ACER PENNSYLVANICUM.

*g*². Deeply incised with more or less acute sinuses and narrow lobes.
h. Star-shaped, lobes glandular serrate. 60. LIQUIDAMBAR STYRACIFLUA.
*h*². Palmate
Lobes incisely toothed.....26. ACER DASYCARPUM.
Lobes furnished with 2–4 secondary lobes..152. A. MACROPHYLLUM.
*f*². Alternate, tendril bearing vine.....78. VITIS AESTIVALIS.
*c*². Linear, sessile, in delicate 2-ranked sprays.....119. TAXODIUM DISTICHUM.
*c*³. Needle-shaped — without distinction of blade and petiole — short, about 1 in. in length, soft and in fascicles of many each..23. LARIX AMERICANA.
*b*². *Compound Leaves.*
c. Palmate, with usually
7 obovate leaflets.....6. ÆSCULUS HIPPOCASTANUM.
5 oblong-lanceolate leaflets.....127. ÆSCULUS CALIFORNICA.
*c*². Pinnate with an odd terminal leaflet, rachis
d. Furnished with prickles.....106. XANTHOXYLUM CLAVA-HERCULIS.
*d*². Not furnished with prickles; leaflets all
e. Petiolulate, leaflets
f. 21–41, each with one or two pairs of glandular teeth at its base. 4. AILANTHUS GLANDULOSUS.
*f*². 11–15,
With prickle-like stipules, entire.....80. ROBINIA PSEUDACACIA.
With foliaceous deciduous stipules.....84. PYRUS SAMBUCIFOLIA.
*f*³. 5–9, glabrous, coarsely serrate.....157. SAMBUCUS GLAUCA.
*f*⁴. 7–9, ovate or lance-oblong, entire or obscurely serrate;
Petioles and branchlets glabrous.....10. FRAXINUS AMERICANA.
Petioles and branchlets velvety pubescent..31. FRAXINUS PUBESCENS.
*f*⁵. 3–5; lateral leaflets
Petiolulate, irregularly toothed.....54. ACER NEGUNDO.
Sessile, subentire.....77. PTELEA TRIFOLIATA.
*e*². Sessile or subsessile
f. Numerous (15-17) and pubescent, especially along the petiole and rachis.
g. Leaflets ovate-lanceolate, finely serrate; pubescence of short, rust-colored clammy hairs; fruit.
h. Subovoid, viscid pubescent.....14. JUGLANS CINEREA.
*h*². Subglobose, nut
Deeply sulcate.....35. JUGLANS NIGRA.
Obscurely subcate.....190. JUGLANS CALIFORNICA.
*g*². Leaflets lance-oblong, coarsely serrate; pubescence of copious, longer and white hairs.....5. RHUS TYPHINA.
*f*². 11–13.....115. CARYA AQUATICA.
*f*³. 5–11.
g. 5, quite glabrous; fruit a ridged nut about 1 in. long with thick epicarp.....36. CARYA ALBA.
*g*². 5–7 or 9,
h. Glabrous, epicarp thin; nut
*h*². Small, thin shelled.....91. CARYA MICROCARPA.
Larger, moderately thick-shelled.....85. CARYA PORCINA.
Tomentose; fruit a samara.....187. FRAXINUS OREGONA.
*g*³. 7–9, epicarp thick and woody, leaflets
Puberulent; bark shaggy.....64. CARYA SULCATA.
Tomentose and odorous.....90. CARYA TOMENTOSA.
*g*⁴. 7–11,
Lanceolate, acute at base, minutely glandular and pubescent beneath.....37. C. AMARA.
Oblong-lanceolate, glabrous, obtuse or rounded at base; fruit a samara, flat at base.....62. FRAXINUS SAMBUCIFOLIA.
*b*³. *Decompound Leaves.*
c. Petioles smooth or pubescent; pinnnæ
d. Remaining on during the season; leaves
e. Regularly bipinnate; pinnæ
f. 2, leaflets,
4–6, small (2–3 lines long).....128. CERCIDUM TORREYANUM.
12–30 or more, ½–1¼ in. long.....129. PROSOPIS JULIFLORA.

f^2. 7, leaflets, sessile. .....105. MELIA AZEDARACH.
e^2. Regularly bipinnate except for the lowest pair of single leaflets; leaflets stalked . .....27. GYMNOCLADUS CANADENSIS.
e^3. Irregularly bipinnate, leaflets small and sessile,
12–18 in number ..... 109. GLEDITSCHIA MONOSPERMA.
18–24 in number .. ..27. GLEDITSCHIA TRIACANTHOS.
d^2. Quickly falling away and petioles developing into phyllodia
155. ACACIA MELANOXYLON.
c^2. Petioles prickly, leaves large, with ovate, sessile, serrate leaflets.
8. ARALIA SPINOSA.
a^2. **Subdeciduous Leaves**—a part only of the leaves falling in autumn, the rest remaining green through the winter.
Obovate-spatulate, entire, shining green both sides.
118. QUERCUS AQUATICA.
a^3. **Persistent Leaves**—evergreen.
b. Simple
c. Needle-shaped and quite stiff, pointing every way,
d. In fascicles (*Pinus*) of
e. Two each, a membranous sheath inclosing the base of each fascicle, about
f. 1 in. long, sheaths very short .....99. P. BANKSIANA.
f^2. 1½–2½ in. long and
Stout; sheaths ⅛ in. or less; branchlets smooth and purple
98. P. INOPS.
Slender ⅛ in. or more; branchlets rough-scaly .....148. P. CONTORTA.
f^3. 2–3 in. long, slender, with short sheaths..... .....122. P. CLAUSA.
f^4. 3–5 in. long,
g. Slender; branchlets
Rough.... .....75. P. MITIS.
Smooth. ....123. P. GLABRA.
g^2. Thicker; cones in whorls and very oblique.....170. P. MURICATA.
f^5. 5–6 in. long, thicker, sheaths elongated.... .....19. P. RESINOSA.
e^2. Three each and
f. 3–6 in. long; cones
1½–3 in. long, little if at all oblique .....50. P. RIGIDA.
3–5 in. long, very oblique.....199. P. RADIATA
f^2. 5–8 in. long.....121. P. SEROTINA.
f^3. 7–10 in. long, very stout .....147. P. PONDEROSA.
f^4. 8–15 in. long; cones
Subterminal, slightly if at all oblique.....124. P. PALUSTRIS.
Lateral, very oblique and heavy
4-8 in. long; leaves slender, pale blue-green .....198. P. SABINIANA.
10-14 in. long; leaves stout, dark green..... .....169. P. COULTERI.
e^3. Both two and three each.. .....125. P. CUBENSIS.
e^4. Five each,
3–5 in long
Very slender; cones 4–6 in. long .....49. P. STROBUS.
Rather stout, cones 10–18 inches long.....146. P. LAMBERTIANA.
9-13 in. long; cone-scales thickened at apex and furnished with strong prickle .....197. P. TORREYANA.
d^2. Not in fascicles (scattered)
e. Ridged above and below and base
f. Elevated and persistent
g. 4-sided; branchlets
Pubescent .....20. PICEA NIGRA.
Glabrous..... .....100. PICEA ALBA.
g^2. Flat; branchlets smooth; cones cylindrical.....149. PICEA SITCHENSIS.
f^2. Not elevated nor persistent; leaves short thick and crowded.
174. ABIES MAGNIFICA.
e^2. Terete..... .....196. PINUS MONOPHYLLA.
c. Linear, flat and
d. Conspicuously 2-ranked (diverging in two directions),

e. Petioled and margin
Obscurely denticulate, 8 lines or less in length..21. TSUGA CANADENSIS.
Entire, revolute, ½-1 inch in length .....144. TAXUS BREVIFOLIA.
*e*². Subsessile rigid and sharply bristle-pointed, about 1 inch long and generally tapering from wide base.....120. TORREYA TAXIFOLIA.
1-3 inches long, of more nearly uniform width.
145. TORREYA CALIFORNICA.
*c*³. Sessile, entire, keeled below
f. Narrow linear, obtusely pointed
¾ in. long or less..... 22 ABIES BALSAMEA.
2-3 in. long..... .. 173. ABIES CONCOLOR.
*f*². Wide-linear, pungent at apex, ¾ in. long or less
143. SEQUOIA SEMPERVIRENS.
*d*². Somewhat 2-ranked, short-petiolate
e. Articulated on a permanent-base and keeled above
171. TSUGA PATTONIANA.
*e*². Breaking away entire and leaving permanent leaf-scars
¾ to 1 in. long; winter buds ⅛–¼ in.
150. PSEUDOTSUGA TAXIFOLIA.
¾ to 1¼ in. long; winter buds ¼–½ in.
PSEUDOTSUGA MACROCARPA.
*c*². Scale-like or awl-shaped, imbricated and closely appressed
d. In 4 ranks and making a conspicuously
e. Flat two-edged branchlet ..... 24. THUYA OCCIDENTALIS.
*e*². Flattish but narrower branchlet.....141. LIBOCEDRUS DECURRENS.
*e*³. 4-angled rather than flat branchlet; cone subglobose, with peltate valvate scales; cones about
⅛ in. long .....74. CHAMÆCYPARIS THYOIDES.
½-1 in. long ..... 166. CUPRESSUS GOVENIANA.
1-1½ in. long.....195. CUPRESSUS MACROCARPA.
*d*². Ternate leaves
Roundish at apex..... 166. JUNIPERUS CALIFORNICA.
More acute at apex.....168. JUNIPERUS OCCIDENTALIS.
*d.*³ Scattered, or spirally arranged, mostly carniate...142. SEQUOIA GIGANTEA.
*c*⁴. Laminate and
d. Ovate to oblong
e. Single-ribbed
f. 1-5 in. long, at base
g. Rounded, truncate or slightly heart-shaped,
h. Pale or glaucous beneath, darker above.
i. 1-1½ in. long, spinose-dentate..... 156. PRUNUS ILICIFOLIA.
*i*². 2-3 in. long, entire.....153. RHUS OVATA.
*i*³. 3-5 in. long, entire
Whitish beneath, flat.....132 ARBUTUS MENZIESII.
Greener beneath, curving lengthwise..... 180. RHUS LAURINA.
*i*⁴. 2-4 in. long, undulately spinose-toothed ... .52. ILEX OPACA.
*h*². Tomentose and concave beneath; margin
i. Entire and undulate... ....131. GARRYA ELLIPTICA.
*i*². Both entire and spinose-toothed leaves on the same tree.
j. Lateral veins strongly impressed above, parallel and continuous to the margins, which are serrate, or occasionally entire.
138. QUERCUS DENSIFLORA.
*j*². Not strongly impressed, and less parallel, pubescent at first beneath and finally
Glabrous, margin undulate, spinose-toothed
137. QUERCUS AGRIFOLIA.
Glaucous, sinuate spinose-dentate. ..161. QUERCUS CHRYSOLEPIS.
*g*². Obtuse to acute, stiff, coriaceous, yellow-green beneath.
176. RHAMNUS INSULARIS.
*g*³. Cuneate at base, glabrous or nearly so beneath, slightly revolute, flat.
159. UMBELLULARIA CALIFORNICA.
*f*². 6-12 in. long, thick, entire, acute at both ends.
101. MAGNOLIA GRANDIFLORA.

*f*³. 3–6 in. long, blade
g. Articulated to the petiole, which is
Conspicuously winged; stamens usually 20.
103. CITRUS AURANTIUM.
Slightly, if at all, winged; stamens usually 35.
104. CITRUS LIMONUM.
*g*². Not articulated to petiole which is
Scarcely 1 in. long.. ....158. RHODODENDRON CALIFORNICUM.
1½–3 in. long.. ....188. NICOTIANA GLAUCA.
*e*². Three-ribbed (*Ceanothus*), in length
1–1½ in., oblong.....151. C. THYRSIFLORUS.
2–4 in., broad ovate.....177. C. ARBOREUS.
*d*². Obovate to oblong.
½ to 1½ in. long, serrate above and entire at base.
130. CERCOCARPUS PARVIFOLIUS.
2 to 5 in. long, with
Entire revolute margin.....117. QUERCUS VIRENS.
Glandular-serrate margin... .....181, HETEROMELES ARBUTIFOLIA.
*d*³. Ovate-orbicular, thick and obtuse at apex... ...179. RHUS INTEGRIFOLIA.
*d*⁴. Lanceolate, lateral veins
Parallel.....182. LYONOTHAMNUS FLORIBUNDUS.
Not parallel, 2–4 in. long.....186. OLEA EUROPEA.
*d*⁵. Lanceolate oblong.
e. 3–5 in. long, margin
f. Crenate-serrate .....102. GORDONIA LASIANTHUS.
*f*². Crenate-dentate (and entire) tomentose beneath.
191. QUERCUS TOMENTELLA.
*f*³. Sinuate-dentate (and entire) glabrous beneath, dark-green above.
192. QUERCUS WISLIZENI.
*f*⁴. Entire and leaves
g. Opposite, glabrous beneath.. .....112. OSMANTHUS AMERICANUS.
*g*². Alternate and beneath
Rusty-pubescent.....113. PERSEA PALUSTRIS.
Golden-scurfy beneath .....139. CASTANOPSIS CHRYSOPHYLLA.
*e*². 2 in. long, entire, glandular beneath..... ...108. CLIFTONIA LIGUSTRINA.
*d*⁶. Oblanceolate, serrate, with short stout petioles .164. MYRICA CALIFORNICA.
*d*⁷. Linear-lanceolate, with broad clasping base and sharp horny tip
175. YUCCA ARBORESCENS.
*d*⁸. Falcate and vertically disposed upon the branchlet.
183. EUCALYPTUS GLOBULUS.
*d*⁹. Peltate and palmately 7 — many-lobed..... ...189. RICINUS COMMUNIS.
*d*¹⁰. Flabellate, large and filiferous .....200. WASHINGTONIA FILAMENTOSA.
*b*². Compound, drooping and with 12-15 pairs of lanceolate leaflets.
178. SCHINUS MOLLE.
*a*⁴. **Leaves Subpersistent** — evergreen southward, but more or less deciduous northward, or individual trees shedding their leaves while most of the trees do not.
Narrow obovate; 1–3 in. long .....107. CYRILLA RACEMIFLORA
Lanceolate to oval, 3–6 in. long, glaucous beneath..51. MAGNOLIA GLAUCA.
*a*⁵. *Leaves* wanting; branches green, jointed and flattened..184. OPUNTIA TUNA.

A KEY BASED UPON THE FRUIT,

Designed as an Aid in identifying the Species represented in Parts I-VIII inclusive, when in Season for procuring the Fruit.

N. B. — The remarks concerning the use of the Key based upon the Leaves are equally true with reference to this.

a. **Free Fruit.** — formed by the ripening of a single pistil either simple or compound.
b. *Indehiscent pericarp.*
c. Samara — dry, usually 1-celled, 1-seeded and with 1-2 membranous wings.
d. In terminal panicles; wing somewhat oblong-lanceolate, with a lenticular seed at about its center, and beyond which the wing is twisted (*Ailanthus*) ..... 4. A. GLANDULOSUS.
*d*². In terminal cymes, a 2-seeded suborbicular samara, winged all around. 77. PTELEA TRIFOLIATA.
*d*³. In umbellate corymbs, each pedicel supporting a pair of samaræ with oblanceolate wings, obtuse at the apex and with main rib on outer margin (*Acer*).
e. Fruit maturing in the fall, wings slightly divergent..7. A. SACCHARINUM.
*e.*² Fruit maturing in early summer.
f. Large, 1¼ in. or more, downy when young.....26. A. DASYCARPUM.
*f*². Smaller, smooth, pendulous and
Red, in umbels.....53. A. RUBRUM.
Greenish, in racemes, wings incurved.....54. A. NEGUNDO.
*d*⁴. In terminal racemes, two samaræ on a single pedicel with main rib on outer margins; seed-bearing portion
Glabrous..... 79. ACER PENNSYLVANICUM.
Densely hairy.....152. ACER MACROPHYLLUM.
*d*⁵. In axillary racemes or panicles, winged at the apex with a more or less lanceolate obtuse wing (*Fraxinus*).
e. Terete at base (seed-bearing portion); branchlets and petioles
f. Smooth..... 10. F. AMERICANA.
*f*². Velvety pubescent; lateral leaflets
Petiolubate.....31. F. PUBESCENS.
Sessile or nearly so.....187. F. OREGONA.
*e*². Flat — wing extending along the seed-bearing portion. 62. F. SAMBUCIFOLIA.
*d*⁶. In lateral fascicles or clusters, winged all round (*Ulmus*).
Sessile or nearly so, cell pubescent and margin not ciliate. 11. U. FULVA.
In fascicles, cell smooth, margin densely ciliate.....33. U. AMERICANA.
In racemes, cell pubescent, margin ciliate.....34. U. RACEMOSA.
*c*² Drupe or drupe-like and with a single seed.
d. Fibro-fleshy and dryish pericarp.
e. Small, ½ in. or less, subglobose (*Rhus*), in terminal
f. Thyrses and clothed with crimson hairs.....5. R. TYPHINA.
*f*². Panicled spikes and clothed with viscid gray hairs, 2-3 lines in length. 153. R. OVATA.

5 lines in length....179. R. INTEGRIFOLIA.
*e*². Larger and with edible embryo (*Juglans*), in length
f. ⅜–1¼ in., globose, with pubescent epicarp....190. J. CALIFORNICA.
*f*². 2 in., ovoid-oblong, covered with brownish viscid hairs..14. J. CINEREA.
Globose, roughly dotted....35. J. NIGRA.
*d*². Fleshy pericarp,
e. Ovoid and
f. Clustered on axillary peduncles,
g. On the growth of the season, 2 or 3 together, 2½ in. long, blue,
h Sessile upon the peduncle; stone longitudinally striated.
9. NYSSA MULTIFLORA.
*h*². Pedicellate, stone not striated; fruit subtended by
Persistent calyx-tube and lobes, ⅛ in. or less in length
113. PERSEA PALUSTRIS.
Enlarged calyx-tube only, 1 in. or less in length.
159. UMBELLULARIA CALIFORNICA.
*g*². On growth of the previous season....111. FORESTIERA ACUMINATA.
*f*². Racemed, bluish and with short, fleshy, red pedicels.
32. SASSAFRAS OFFICINALE.
*e*². Ovoid-oblong, 1–1¼ in. long, stone compressed....81. PRUNUS NIGRA.
*e*³. Oblong, tipped with the remnants of the style and about 1 in. in length.
Reddish and stone longitudinally striated with membranous edged ridges....110. NYSSA OGECHE.
Dark blue, stone not membranous-ridged; flesh
Thin and dryish....112. OSMANTHUS AMERICANUS.
Thicker and very oily....186. OLEA EUROPEA.
Black and borne in abundance on paniculate spadices.
200. WASHINGTONIA FILAMENTOSA.
*e*⁴. Subglobose and surface
f. Smooth
g. Purple or purplish black and
h. Solitary, of sweet flavor....12. CELTIS OCCIDENTALIS.
*h*². In racemes and of a vinous or astringent flavor; racemes
4–6 in. long; drupes numerous and ¼ in. thick.
29. PRUNUS SEROTINA.
1–3 in. long; drupes few and larger....156. PRUNUS ILICIFOLIA.
*h*³. In umbels, larger, of
Acid-vinous flavor, ½ in. in diameter....82. PRUNUS CERASUS.
Sweet-vinous flavor, ¾ in. in diameter....56. PRUNUS AVIUM.
*g*². Red, small and very sour....55. PRUNUS PENNSYLVANICUM.
*g*³. Whitish
Not tipped with remnants of the style, rosy-cheeked
178. SCHINUS MOLLE.
Tipped with the stout styles....180. RHUS LAURINA.
*f*². Papillose and with waxy exudation....164. MYRICA CALIFORNICA.
*c*². Drupe-like but containing more than one seed, and seeds
d. Inclosed in a bony
e. 2–3-celled stone,
f. Blue, subglobose, in flat-cymes with red stems.
87. CORNUS ALTERNIFOLIA.
*f*². Bright-red, elongated, sessile, usually in a single head
Only 3 or 4 developing....88. CORNUS FLORIDA.
30 or 40 developing....185. CORNUS NUTTALLII.
*e*². 3–5-celled stone; yellowish-white, in loose axillary panicles.
105. MELIA AZEDARACH.
*d*². Distinct, (not inclosed in a common stone); fruit
e. Crowned with persistent
f. Calyx-teeth,
g. Purple-black, 5-seeded, in umbels....8. ARALIA SPINOSA.
*g*². Red or purplish,
4–8 seeded, axillary....52. ILEX OPACA.
2-seeded in terminal panicles....181. HETEROMELES ARBUTIFOLIA.

*f*². Style or remnants of it ; fruit about
⅛ in. long, dryish, in racemes .. ..107. CYRILLA RACEMIFLORA.
¼ in. long, juicy, in cymes.....157. SAMBUCUS GLAUCA.
*f*³. Not crowned with either calyx-teeth or style,
g. Sessile, scaly-bracted beneath ; leaves evergreen.
Dark blue, seeds 1–4.....25. JUNIPERUS VIRGINIANA.
Blue-black, seeds 2–3 . .....168. JUNIPERUS OCCIDENTALIS.
Reddish-brown, seeds 1–2. ..... 167. JUNIPERUS CALIFORNICA.
*g*². Pedicellate, not scaly-bracted beneath, slightly 2-3-lobed, 2-3-seeded,
Black; nutlets indehiscent .....126. RHAMMUS PURSHIANA.
Red; nutlets dehiscent.....176. RHAMMUS INSULARIS.
*c*⁴. Nut—hard, single coat and furnished with an involucral cup or covering.
d. Ovoid oblong or ellipsoidal, surrounded at its base with an involucral cup (*Quercus*), acorn borne
e. On the new wood of the season (*i. e.* maturation annual) cup
f. Less than ¼ enveloping the oval acorn.....136. QUERCUS GARRYANA.
*f*². About ¼ enveloping the small
Ovoid nut ⅝ in. long : scales thin.....68. Q. MUHLENBERGII.
Long, narrow nut, often 2 in. long.....160. Q. LOBATA.
*f*³. About ⅛ enveloping the nut
g. Thick, scales very roughly tubercled, edge of cup rather inturned after shedding the nut ; nut usually long-ovoid .....38. Q. ALBA.
*g*². Thinner, scales thinnish ; leaves
Deciduous ; peduncles shorter than petioles....67. QUERCUS PRINUS.
Subpersistent ; acorns sessile or nearly so..137. QUERCUS AGRIFOLIA.
*f*⁴. Scarcely ½ enveloping the oblong-ovoid nut about 1¼ in. in length.
116. QUERCUS MICHAUXII.
*f*⁵. About ½ or more enveloping the nut; peduncles longer than the petioles ; nut
⅝ in. long, light brown.....66. QUERCUS BICOLOR.
½ in. or less long, dark brown.....117. QUERCUS VIRENS.
*f*⁶. About ½ or more enveloping the nut ; peduncles
g. Longer than the petioles..... .....66. Q. BICOLOR.
*g*². Shorter than the petioles ; scales
Very loosely appressed, forming a moss-like fringed margin of cup.
39. Q. MACROCARPA.
More closely appressed and not forming a moss-like fringe.
92. Q. OBTUSILOBA.
*e*². On wood of the preceding season (*i. e.* maturation biennial) ; cup
f. Very shallow, almost flat and with long-linear recurved scales.
138. QUERCUS DENSIFLORA.
*f*². Saucer-shaped,
One-fourth enveloping the nut which is
1 in. or less in length; saucer thin ..... 15. Q. RUBRA.
1½ in. long ; saucer thin at rim..... ....191. Q. TOMENTELLA.
2 in. or less in length ; saucer usually thick.....161 Q. CHRYSOLEPIS.
One-half enveloping an ovoid nut.....162. Q. CALIFORNICA.
*g*². Flattened-globose ; leaves
Sinuate-pinnatifid with wide sinuses..... 94. QUERCUS PALUSTRIS.
Obovate-spatulate, entire.....118. QUERCUS AQUATICA.
*f*³. Top-shaped, ½ enveloping the acorn ; scales thin and coarse ;
Inner bark of tree reddish..... .....69. Q. COCCINEA.
Inner bark yellowish..... ....93. Q. TINCTORIA.
*f*⁴. Turbinate, ½ enveloping the nut ....192. Q. WISLIZENI.
*d*². Club-shaped, short, surrounded with stiff hairs, tipped with the persistent recurved style and arranged in globular heads, which are
Solitary.....13. PLATANUS OCCIDENTALIS.
2–7 together in a moniliform spike .....135. PLATANUS RACEMOSA.
*d*³. Achenium-like, small and borne in short catkins,
Inclosed in a membranous inflated sac, catkin hop-like.
41. OSTRYA VIRGINICA.
Subtended by a large leafy bract..... ....42. CARPINUS CAROLINIANA.
*c*⁵. Nut-like, dry, not invested with an involucre,

Smoothish, globose, about ¼ in diameter, in cymes with leaf-like bract attached.....3. TILIA AMERICANA.
Rough, with scale-like points, ovate, coriaceous.
114. PLANERA AQUATICA.

*c*⁶. Pod (legume) which is
d. Oblong, flat, about 2 in. broad and curved .27. GYMNOCLADUS CANADENSIS.
*d*². Linear or nearly so
10–18 in. long, contorted and twisted....28. GLEDITSCHIA TRIACANTHOS.
4–6 in. long, subterete, compressed between the seeds and thick-valved.....129. PROSOPSIS JULIFLORA.
3–4 in. long, 2–8 seeded and thin valved..128. CERCIDIUM TORREYANUM.
*d*³. Obliquely ovate (1–2 in. long), long stalked and mostly 1-seeded.
109. GLEDITSCHIA MONOSPERMA.
*d*⁴. Ovate, compressed and with accrescent calyx.....154. DALEA SPINOSA.
*c*⁷. Pome; capsules
d. Cartilaginous; fruit
e. Sunken at insertion of pedicel,
f. Globular
Large, 1 in. or more, distinctly 5-celled..... .. ..30. PYRUS MALUS.
Small, more or less 10-celled.....59. AMELANCHIER CANADENSIS.
*f*². Fattened-globose, waxy, fragrant and very tart..83. PYRUS CORONARIA.
*e*². Not sunken at insertion of pedicel, pyriform .....57. PYRUS COMMUNIS.
*d*². Not cartilaginous, 1–5 bony seeds.
⅜ in. in diameter, red or yellow, with white spots.
58. CRATAEGUS PUNCTATA.
½ in. in diameter, leaves wedge-obovate....85. CRATAEGUS CRUS-GALLI.
*c*⁸. Berry.
d. With persistent thickish calyx-lobes, large (about 1 in. or more),
61. DIOSPYROS VIRGINIANA.
*d*². Without persistent calyx-lobes and smaller
e. In thyrses .....78. VITIS ÆSTIVALIS.
*e*². In compact-racemes and
Hoary-tomentose .....131. GARRYA ELLIPTICA.
Smooth and flattened-globose.....133. ARCTOSTAPHYLOS PUNGENS.
*e*³. In open panicles.....132. ARBUTUS MENZIESII.
*e*⁴. Singly on the jointed flattened stem..... 184. OPUNTIA TUNA.
*c*⁹. Fleshy, with custard-like edible pulp .....76. ASIMINA TRILOBA.
*c*¹⁰. Berry-like pome, ⅜ in. in diameter and borne in dense clusters.
84. PYRUS SAMBUCIFOLIA.
*c*¹¹. Hesperidum — seeds in juicy pulp and rind leathery.
Subglobose, flattened at the ends.....103. CITRUS AURANTIUM.
Globose-oblong, mammillate at the extremity.....104. CITRUS LIMONUM.
*c*¹². Achenium.
3–4-angled and with membranous wing-like margins.
108. CLIFTONIA LIGUSTRINA.
Linear-oblong, tipped with the prolonged tail-like style.
130. CERCOCARPUS PARVIFOLIUS.
*c*¹³. Baccate but with dry spongy pericarp..... 175. YUCCA ARBORESCENS.
*b*². *Dehiscent pericarp.*
c. Subglobose, and
d. Coriaceous or woody, dehiscent by
e. 2–3 valves and containing one or very few large seeds with smooth shining coat and a large scar (*Æsculus*), fruit
Prickly and leaflets 7.....6 ÆSCULUS HIPPOCASTANUM.
Smooth and leaflets 5 .....127. ÆSCULUS CALIFORNICA.
*e*². 4 more or less distinct valves (*Carya*).
f. Epicarp thick and separating quite freely to the base · nut ridged, with thick shell, globular-ovoid and
g. Flattened,
1 in. or less in length..... .36. CARYA ALBA.
1¼ in. or more in length.....64. CARYA SULCATA.
*g*². Not so much flattened, usually 4-angled .. ....90. CARYA TOMENTOSA.
*f*². Epicarp only moderately thick and nut of medium size, moderately ridged and with shell of medium thickness.....65. CARYA PORCINA.

f^3. Epicarp thin, nuts small and thin-shelled; kernel
g. Astringent and bitter; sutures of epicarp very prominent; nut
Quite smooth, whitish and only slighly compressed.
37. CARYA AMARA.
Rough, reddish, strongly compressed and angled.
115. CARYA AQUATICA.
g^2. Slightly if at all bitter, nut whitish and sutures moderately prominent.
91. CARYA MICROCARPA.
e^3. 5–20 valves recurving from central axis and liberating numerous fine seeds.....158. RHODODENDRON CALIFORNICUM.
d^2. Covered with spines; dehiscent
e. By four valves; nuts
Sharply 3-angled, 2 together, involucre soft-prickly.
16. FAGUS FERRUGINEA
Subovoid, flattened, 1–3 together, involucral spines very sharp and hard.....40. CASTANEA VESCA.
e^2. Irregularly; spines many-branched; nut maturing the second year.
139. CASTANOPSIS CHRYSOPHYLLA.
e^3. Into three cocci, each liberating a single seed....189. RICINUS COMMUNIS.
c^2. Small, ovoid-lanceolate pods arranged in catkins, opening by two valves and containing numerous seeds furnished with silky down; leaves
d. Orbicular-ovate; petioles laterally compressed; leaves
Coarsely dentate.....18. POPULUS GRANDIDENTATA.
Serrate, sharply pointed.....72. P. TREMULOIDES.
Sinuate-toothed, tomentose beneath.....96. P. ALBA.
Obscurely-serrate, with obtuse or rounded apex.
97. P. HETEROPHYLLA.
d^2. Ovate, closely serrate, whitish and reticulate-veined beneath.
47. P. BALSAMIFERA.
d^3. Deltoid-ovate, coarsely crenate-serrate, usually
Abruptly acuminate.....48. P. MONILIFERA.
Shorter pointed or acute.....194 P. FREMONTII.
d^4. Broadly deltoid.....73. P. DILATATA.
d^5. Linear-lanceolate, tomentose on midrib above and petiole.
45. SALIX NIGRA.
d^6. Lanceolate or elliptic lanceolate,
e. Smooth and capsules
f. Sessile or nearly so.....46. SALIX ALBA var. VITELLINA.
f^2. With slender pedicels; leaves pale glaucous beneath and
2–4 in. long.....71. SALIX AMYGDALOIDES.
3–7 in. long.....140. SALIX LAEVIGATA.
e^2. Pubescent; capsules about
$\frac{1}{3}$ in. long, ovate-lanceolate.....193. SALIX NUTTALLII.
$\frac{1}{4}$ in. long, oblong-ovoid.....165. SALIX LASIOLEPSIS.
c^3. Linear compressed pods opening by two valves; pods
4–5 in. long, $\frac{1}{4}$ in. broad, quite straight.....80. ROBINIA PSEUDACACIA.
2 in. long, $\frac{1}{3}$ in. broad, often curved into a circle.
155. ACACIA MELANOXYLON.
c^4. Subcylindrical pods, long, opening by two valves.
6–10 in. long, ¼ in. or less thick.....134. CHILOPSIS SALIGNA
10–12 in. or more long, $\frac{1}{4}$ in. or more thick....89. CATALPA BIGNONIOIDES.
c^5. Ovoid 5-valved capsule.....102. GORDONIA LASIANTHUS.
c^6. Subovoid follicles arranged
In pairs, seed not suspended by a funiculus.
182. LYONOTHAMNUS FLORIBUNDUS.
Not in pairs; seed suspended by a funiculus.
106. XANTHOXYLUM CLAVA-HERCULIS.
c^7. Three-lobed capsules dividing into three dehiscent cocci; (*Ceanothus*) branchlets
Conspicuously angled.....151. C. THYRSIFLORUS.
Slightly angled.....177. C. ARBOREUS.
c^8. Top-shaped capsule of 4 or 5 cells dehiscent at their summits.
183. EUCALYPTUS GLOBULUS.

*c*⁹. Oblong-ovoid 2-valved capsule closely invested by persistent calyx. 188. NICOTIANA GLAUCA.

*a*². **Aggregated Fruit** — composed of many carpels, either closed or opened and cohering or closely massed together, forming a

b. Cone.

c. Scales of the cone open carpels (*Coniferæ*).

d. Scales many and spreading at maturity.

e. Imbricated and each subtended by a bract; ovules, 2, inverted, and

f. Maturing the year after flowering (*Pinus*); cones

g. Subterminal and scales

h. Thin at tip and unarmed; cones subcylindric and

4–6 in. long.....49. P. STROBUS.

12–18 in. long.....146. P. LAMBERTIANA.

*h*². Thickened at tip and

i. Armed with a recurved prickle.

j. 1–3 in. long, cylindric ovoid, oblique.....148. P. CONTORTA.

*j*². 3–6 in. long, glossy-brown,

k. Elongated conical, separating from the tree by a fracture

Within the peduncle.....125. P. CUBENSIS.

Within the base of cone.....147. P. PONDEROSA.

*k*². Broad-ovoid.....197. P. TORREYANA.

*j*³. 6–10 in. long.....124. P. PALUSTRIS.

*i*². Unarmed cones about 2 in. in length, seeds.

Winged, about ⅛ in. long.....19. P. RESINOSA.

Wingless, about ¾ in. long.....196. P. MONOPHYLLA,

*g*². Lateral and scales thickened at tip, cones

h. Slightly or not at all oblique

i. Ovoid-oblong; leaves 3–5 in. long; scales armed with a weak prickle directed

At about right angles from the axis of the closed cone. 75. P. MITIS.

Forward, at about 45° or less from the axis.....123. P. GLABRA.

*i*². Ovoid-pyramidal.

j. Prickles strong; cones 2 in. or

Rather less in length; leaves 1½–3 in. long; branchlets purple. 89. P. INOPS.

Rather more; leaves 3–5 in. long.....50. P. RIGIDA.

*j*². Prickles weak; cones 2–3 in. long, and

Wide-pyramidal; leaves in 3's.....121. P. SEROTINA.

Narrow-pyramidal; leaves in 2's.....122. P. CLAUSA.

*h*². Markedly oblique

2-in. or less in length, scales unarmed.....99. P. BANKSIANA.

2-3½ in. long, scales armed with strong prickles..170. P. MURICATA.

3-5 in. long, outer scales very gibbous; prickle deciduous. 199. P. RADIATA.

4-8 in. long; scales very strongly armed.....198. P. SABINIANA.

10–15 in. long, armed with very large, strong prickles. 169. P. COULTERI.

e.² Valvate, bractless, wedge shaped, spreading, each with 3–7 inverted ovules; cone woody, oval and

2-3 in. long, scales usually 25–30.....142. SEQUOIA GIGANTEA.

1 in. or less, scales short, 20.....143. SEQUOIA SEMPERVIRENS.

f. Maturing the first season — the autumn after blossoming.

g. Ovoid or oblong, ½ in. long, pendent; bracts inconspicuous; scales persistent on the axis, thin and with eroded tip.....20. PICEA NIGRA.

*g*². Ovoid, small (8 lines or less), pendent, scales rounded and entire at tip. 21. TSUGA CANADENSIS.

*g*³. Sub-cylindrical

h. Erect; scales deciduous from the persistent axis (*Abies*).

i. 2–4 in. long; leaves

Less than 1-in. long.....22. A. BALSAMEA.

2 or more in. long.....173. A. CONCOLOR.

6 or 8 in. long.....174. A. MAGNIFICA.

h^2. Nodding, small (about 2 in. long), scales persisting on the axis and entire at tip.....100. PICEA ALBA.

h^3. Pendent, 1½–3 in. long, scales incisely denticulate.
149. PICEA SITCHENSIS.

g^4. Cylindrical oblong; bracts much exserted (*Pseudotsuga*); cones
2–3 in. long.....150. P. TAXIFOLIA.
5–8 in. long.....172. P. MACROCARPA.

g^5. Ovoid or roundish, small, 9 lines or less in length, scales persistent on the axis at maturity.....23. LARIX AMERICANA.

d^2. Scales few, persistent, bractless; cone

e. Oblong and erect, with scales more or less thickened,
Loosely imbricated, 8–12, thinnish.....24. THUYA OCCIDENTALIS.
Valvate, 4–6, thick, only two scales fertile.
141. LIBOCEDRUS DECURRENS.

e^2. Globose or subglobose.
⅛ in. in length.....74. CHAMÆCYPARIS THYOIDES.
1 in. or somewhat less in length.....166. CUPRESSUS GOVENIANA.
1 1½ in. long.....195. CUPRESSUS MACROCARPA.

d^3. Scales not spreading at maturity but breaking irregularly; cones globose.....119. TAXODIUM DISTICHUM.

c^2. Scales.

d. Thin, 3-lobed and deciduous, subtending very small samaræ (*Betula*).

e. Cones erect,
Sessile, ovoid-oblong, 1 in. in length.....17. B. LUTEA.
With downy peduncle, ovoid, smaller.....95. B. NIGRA.

e^2. Cones suberect, ovoid-oblong; scales thicker and with short divergent lobes; wing of nutlet not broader than the body.....44. B. LENTA.

e^3. Cones pendent, cylindrical and about
1 in. in length.....70. B. POPULIFOLIA.
1⅝ in. in length.....43. B. PAPYRACEA.

d^2. Thick, woody and persistent.....163. ALNUS RHOMBIFOLIA.

c^3. Scales closed carpels, growing from an elongated receptacle and consolidated.

d. Dehiscent at maturity along the medium line of the back, and letting out each 1–2 berry-like seeds suspended by extensile threads (*Magnolia*), cone
Cylindrical, curved, 2–3 in. long.....1. MAGNOLIA ACUMINATA.
Oblong, 1–1½ in. long.....51. MAGNOLIA GLAUCA.
Oval, 3–4 in. long.....101. MAGNOLIA GRANDIFLORA.

d^2. Indehiscent at maturity and falling away as samaræ.
2. LIRIODENDRON TULIPIFERA.

b^2. Spherical head, hardened and bristling with 2-beaked capsules.
60. LIQUIDAMBAR STYRACIFLUA.

b^3. Sorosis—a spike with bracts and calyx-lobes all thickened and sacculent.
63. MORUS RUBRA.

a^3. **A Naked Seed**, subtended or surrounded by a fleshy disk.

b. Drupe-like, with fleshy covering, sessile, scaly-bracted beneath and about
1 in. in length, oval.....120. TORREYA TAXIFOLIA.
1½ in. length, obovoid.....145. TORREYA CALIFORNICA.

b^3. Bony seed, subtended by a fleshy cup.....144. TAXUS BREVIFOLIA.

A SYSTEMATIC STUDY.

OF THE

Species whose Woods are Represented in the Accompanying Sections.

The timbers comprised in the series which this text is designed to accompany belong to what are known, botanically speaking, as *Flowering* and mostly *Exogenous Plants.* At the outset, therefore, we will, once for all, define these groups; and, as the characters herein given are equally true of all the species enumerated in the following pages, they need not be repeated in the further definition of the various sub-groups and species.

FLOWERING or PHÆNOGAMOUS PLANTS.

Plants producing flowers which consist essentially of stamens and pistils, the latter bearing ovules or seeds.

In distinction from the *Flowering Plants* are the *Flowerless* or *Cryptogamous Plants*, comprising the rest of the vegetable kingdom, from the very simply organized Slime Moulds and Bacteria up to the highly organized Ferns and Club-Mosses. But in the study of timbers this group is unimportant, as only in a few rare cases do any of its representatives attain the dimensions of trees. Those exceptions are the Tree-Ferns of tropical countries — gigantic ferns, which sometimes attain the height of fifty or sixty feet, with straight shafts quite like tree trunks and tops consisting of a bunch of enormous plume-like fronds. They, however, are of practically no value as timber.

EXOGENOUS or DICOTYLEDONOUS PLANTS.

Flowering plants whose stems consist of a central column of pith surrounded by wood in concentric layers, and this in turn by bark; the stems increasing in thickness by the addition of a new layer each year to the wood externally and to the bark internally. Leaves mostly netted-vein. First leaves of the embryo (cotyledons) two and opposite, or (in the Coniferæ) several in a whorl. Parts of the flower in fours or fives, very rarely in threes.

A second class of *Flowering Plants* and comprising the rest of the group is the *Endogenous* or *Monocotyledonous Plants*, characterized by having stems in which the wood occurs as threads or bundles running through a cellular, pith-like tissue so that a transverse section exhibits the wood as dots and not in concentric rings. Leaves mostly parallel-veined. Embryo with single cotyledon, or rarely two, and then alternate and unequal. Parts of the flower generally in threes. In southern United States and elsewhere in or near the tropics trees are found, such as the Palms, etc., which belong to this class, but none we have to do with at present.

Exogenous plants are subdivided into two well-marked groups or sub-classes — *Angiospermæ* and *Gymnospermæ*. The former includes by far the greater part of the Flowering Plants, and most of the species represented in "American Woods" are representatives of it.

ANGIOSPERMÆ.

Flowering, exogenous plants in which there is a complete pistil — with stigma and closed ovary — containing ovules which develop into seeds at maturity. This sub-class comprises many groups of plants known as *Orders*, and such as are represented by plants which attain the dimensions of trees, within the limits of the United States, we propose to consider in the following pages:

ORDER **RHAMNACEÆ**: BUCKTHORN FAMILY.

Leaves simple, mostly alternate and with stipules small or wanting. *Flowers* small, often polygamous and sometimes dioecious; sepals valvate in aestivation, small, distinct, concave and involute in the bud or wanting; stamens as many as the petals and opposite them, inserted with them in the edge of a perigynous disk lining the calyx-tube, short and sometimes connected with the lower part of the ovary; pistil solitary, with mostly superior ovary, 2-5 celled, each cell with a single erect anatropous ovule; stigmas 2-5. *Fruit* a drupe or pod with one seed in each cell and not arilled; embryo large with broad cotyledons and sparing fleshy albumen.

Order represented by small trees and shrubs of warm and temperate countries, with slightly bitter juice and often nauseous or purgative fruits.

GENUS RHAMNUS, LINNAEUS.

Leaves mostly alternate, pinnately veined, entire or dentate, petiolate, conduplicate in vernation; stipules small and deciduous. *Flowers* small, greenish, in axillary racemes or cymes, polygamous or dioecious; calyx campanulate, the tube lined with the disk, 4-5 cleft, the lobes keeled within and deciduous; petals small, with short claw, more or less notched at apex and turned in around the stamens, deciduous; stamens with very short subulate filaments and introrse 2-celled anthers opening lengthwise; pistil free, with 2-4-lobed stigma and 2-4-celled ovary, each cell containing a solitary, erect, anatropous ovule. *Fruit* a globose or oblong, blackish, berry-like drupe, with fleshy epicarp, and containing 2-4 cartilaginous, 1-seeded nutlets; seeds longitudinally grooved on the back.

Trees and shrubs of considerable economic importance, and the name, *Rhamnus*, is the classical Greek name, **ῥάμνος**, of the European Buckthorn.

176. RHAMNUS INSULARIS, GREENE.

ISLAND BUCKTHORN, ISLAND BEARWOOD.

Ger., *Eiländischer Kreuzdorn;* Fr., *Nerprun insulaire;* Sp., *Ramno de isla.*

SPECIFIC CHARACTERS :— *Leaves* alternate, persistent, ovate-oblong, 1 to 1½ and sometimes 3 in. in length, coriaceous, glabrous or sparingly pubescent, about equally pointed at both ends, minutely glandular crenate-serrate with short stout petioles and straight prominent mid-ribs, yellowish green, paler and frequently yellowish beneath; stipules falling away early; new growths sparingly pubescent. *Flowers* four-numerous, dioecious, greenish, in small clusters from the axils of the leaves on the shoots of the year, or of small bracts, with slender sparingly pubescent pedicels rather more than ¼ in. in length; calyx campanulate with acuminate lobes; petals wanting (though according to Prof. Trelease are sometimes present); stamens with stout incurved filaments and large antlers; pistil with ovoid ovary and rather slender style two-lobed above. *Fruit* red, subglobose, about ¼ in. or a trifle more in length, slightly grooved, with thin, dry flesh and containing 1-3 ovoid nutlets pointed at the apex, dehiscent along the inner angle, grooved on the back, with thin brown testa and thick foliaceous cotyledons. (*Insularis* is the Latin for *belonging to an island* and relates to the habitat of the species.)

A small tree with rigid branches, rarely more than 25 ft. (7 m.) in height, with trunk sometimes 12 in. (0.30 m.) in diameter and having a dark brown bark about ¼ in. thick and rough with small, firm, irregular scales and ridges.

HABITAT. — The islands off the coast of southern California, Santa Cruz Mountains on the adjacent mainland and Cedros Island off the coast of Lower California, growing along slopes with Scrub Oak, which it considerably resembles in general aspect, *Ceanothus arboreus*, etc.

PHYSICAL PROPERTIES. — Wood very heavy, hard and close grained, with very fine regularly arranged ducts, susceptible of a very smooth polish and of a rich red-brown color with scant yellow sap-wood.

USES. — We know of no use to which this small tree is applied, though the bark might be used for dyeing purposes, as with other representatives of the genus, and the wood would make excellent fuel.

MEDICINAL PROPERTIES we believe have not been reported of this species, but would doubtless be found to be tonic and laxative as with other species of the genus.

Rhamnus insularis, Greene, is considered by some botanists as a variety of *Rhamnus crocea, Nutt.*, (*Rhamnus crocea insularis, Sarg.*), but it is certainly a well-marked form differentiated from the true *R. crocea* by characters as important as distinguish many other species, and I am inclined to agree with Prof. Greene in giving it specific rank.

GENUS CEANOTHUS, LINNAEUS.

Leaves mostly alternate, petioled, coriaceous or somewhat so, glabrous or variously pubescent, deciduous or persistent, with slender stipules falling away early, *Flowers* perfect, in showy terminal or axillary thyrsoid or cymose clusters, blue or white and with colored pedicels; calyx colored, 5-lobed, cohering with the ovary below, the triangular lobes incurved and deciduous; petals much exserted, hooded, spreading, with long slender claws; stamens 5, opposite the petals and inserted with them, spreading and often persistent, with long filaments and introrse 2-celled anthers longitudinally dehiscent; pistil with three short styles united below and single 3-celled and usually 3-lobed ovary surrounded with a fleshy persistent disk and containing a single erect orthotropous ovule in each cell. *Fruit* subglobose, 3-lobed, drupe-like at first, with persistent calyx-tube adnate at base, finally becoming dry and separating into three 2-valved dehiscent cocci each liberating a single obovate-lenticular seed with thin crustaceous testa, ventral raphe and fleshy albumen.

The genus is composed of about thirty species, mainly of shrubs, and is confined to North America, the greater number being found in California where some natural hybrids seem to occur. The name is of classical Greek origin and of rather obscure application.

177. CEANOTHUS ARBOREUS, GREENE.*

TREE MYRTLE.

Ger., *Baumische Myrte;* Fr., *Myrte d'arbre;* Sp., *Mirto de Arbol.*

SPECIFIC CHARACTERS: — *Leaves* alternate, ovate to broad elliptical, 2–4 in. long, acute, rounded at base, glandular-crenate-serrate, dark green above, and with pale dense short tomentum and prominent veins beneath; petioles ½–¾ in. in length and, as with the new growths, densely pale-tomentose; stipules about ¼ in. long and early deciduous; branchlets slightly angled. *Flowers* pale blue, produced in ample compound hoary-pubescent thyrsoidal clusters on axillary peduncles near the extremities of young branches, with slender hair-like pedicels produced in the axils of large scarious hoary caducous bracts. *Fruit* black when mature and ¼ in. in diameter.

(*Arboreus* is a Latin adjective from *arbor, tree.*)

This is a small handsome tree with wide top, rarely over 25 ft. (7.50 m.) in height, or with trunk more than 10 or 12 in. (0.30 m.) in diameter. The bark, at first of a gray color and quite smooth, becomes with age of a dark brown color fissured into small square thickish scales. It is the most truly arboreal representative of the genus, though in many regions is only a bush with many slender branches.

HABITAT. — The islands of Santa Catalina, Santa Cruz and Santa Rosa, off the coast of southern California, growing along the slopes and sides of cañons.

PHYSICAL PROPERTIES. — Wood very heavy, hard, close-grained, with annual layers marked by an aggregation of fine open ducts, and of a red-brown color with lighter sap-wood. *Specific Gravity*, 0.7781; *Percentage of Ash*, 2.05; *Relative Approximate Fuel Value*, 0.7622; *Weight of a Cubic Foot in Pounds*, 48.49.

* *Ceanothus velutinus*, var. *arboreus*, Sarg.

USES. — No use is made of this tree though its beauty, especially when in flower, should give it rank in ornamental planting. The wood is doubtless excellent for fuel.

MEDICINAL PROPERTIES. — We do not know that the medicinal properties of this species have yet been studied.

ORDER **ANACARDIACEÆ**: CHESHEW FAMILY.

Leaves alternate, simple or compound, without pellucid dots; stipules none. *Flowers* polypetalous, small, often polygamous, regular and furnished with bracts; sepals 3–5, united at the base, persistent; petals 5 (or sometimes wanting), imbricated in the bud; stamens 5 or 10, alternate with the petals and perigynous, ovary free, 1-celled and 1-ovuled; styles or stigmas 3. *Fruit* a berry or drupe, the seed containing no albumen.

Trees or shrubs with a milky resinous or gummy acrid juice, which, as well as the exhalations, are often poisonous.

GENUS SCHINUS, LINNAEUS.

Leaves evergreen, alternate, unequally pinnately compound, with sessile leaflets. *Flowers*, small, whitish, diœcious, in large axillary terminal bracteate panicles; calyx short, with 5 imbricated lobes; petals 5, imbricated, annular disk rather broad; stamens 10, styles 3; ovary 1-celled with single ovule suspended from above the middle of the cell. *Fruit*, small globose oily drupes.

A genus of trees and shrubs of about a dozen mostly tropical American species and the name, *Schinus*, is the old Greek name, σχῖνος, of the Mastic-tree, applied to this genus on account of the mastic-like juice which exudes from its various representatives.

178. SCHINUS MOLLE, L.

PEPPER-TREE. CHILI PEPPER. FALSE PEPPER.

Ger., *Pfefferbaum;* Fr., *Poivrier faux;* Sp., *Pimiento falso.*

SPECIFIC CHARACTERS: — *Leaves* 8–12 in. long, of numerous (12 or 15 or more) pairs of remote and irregularly disposed lanceolate sessile entire or remotely serrate leaflets, the terminal one longest; leaves and new growths generally very thinly coated with a gummy exudation. *Flowers* (in Feb. and Mar. in California) in large pendent thyrses, small yellowish green, terminating the long flexuous branchlets. *Fruit* small drupes scarcely as large as peas, beautifully rosy-cheeked, of strongly pungent flavor and hanging in long loose clusters.

The specific name, *Molle*, is a modification of the Peruvian name of the species *Mulli*.

A tree sometimes 3 or 4 ft. (1 m.) in diameter of trunk, with rather irregular, wide top, of few large branches and long, gracefully pendent branchlets. It is a very handsome tree in all seasons of the year, with its drooping graceful habit and airy evergreen foliage, but when bedecked with its many clusters of light-red fruit hanging from the tip of each branchlet it is of very striking and beautiful appearance. The bark of trunk is of a grayish-brown color and with age becomes split into many longitudinal and obliquely connecting, firm, fibrous ridges.

HABITAT. — The *Schinus Molle* is a native of tropical America, Mexico to Brazil and Peru, but has been extensively planted in warm countries elsewhere for ornamental purposes. The climatic conditions of southern California seem thoroughly congenial to it and it has there been very extensively planted, becoming naturalized in places.

PHYSICAL PROPERTIES. — Wood rather soft, light, tough, with obscure layers of growth, fine medullary rays and quite regularly disposed bands of fine ducts. It is of a mottled brown color with copious pinkish or brownish-white sap-wood.

USES. — Almost the exclusive use of this tree with us is for ornamental planting, for which it is justly very popular. It is found ornamenting the streets and door yards everywhere throughout southern California where it grows rapidly and attains its largest size. In that region it is now a feature of almost every suburban scene. The trees when felled make fairly good fuel.

MEDICINAL PROPERTIES. — The leaves and bark and the gum-resinous exudation have been employed medicinally. The fruit has been used successfully in the treatment of gonorrhœa, as a substitute for cubebs.* It also possesses purgative properties.

NOTE. — When fragments of the fresh leaves of this tree are placed in water they move about by jerks as they float upon its surface, as though animate objects possessed of an ability of voluntary motion. This motion is caused by the bursting of glands in the tissues and the discharge therefrom of a volatile oil.

GENUS RHUS, LINNAEUS.

Leaves alternate, mostly compound (rarely simple) without stipules. *Flowers* minute, white or greenish, polygamous or dicœcious by abortion, in axillary or terminal compound panicles; calyx 5-lobed, generally persistent; petals 5, longer than the lobes of the calyx and inserted under the margin of the disk which surrounds the base of the free ovary imbricated in aestivation; stamens 5, alternate with the petals, with subulate filaments and oblong introrse 2-celled anthers, attached by the back and longitudinally dehiscent, rudimentary in the pistillate flowers; pistil with 1-celled ovary, three terminal styles with capitate stigmas, the ovary containing a single anatropous ovule suspended by a funiculus rising from the base of the cell. *Fruit* a smooth or hairy berry with thin dryish and resinous sarcocarp and crustaceous or horny endocarp; seed destitute of albumen and with thin membranous testa.

(The name, *Rhus*, is the old Latin and Greek name of the Sumach.)

179. RHUS INTEGRIFOLIA, B. & H.

SOUR-WOOD, SOUR OAK, SOUR-BERRY, MAHOGANY.

Ger., *Sauerbeere;* Fr., *Sumac Occidental;* Sp., *Zumaque Occidental.*

SPECIFIC CHARACTERS: — *Leaves* usually simple (but sometimes showing a disposition to become compound, as leaves are found, especially on Santa Catalina Isd., with from two to five leaflets) persistent, irregularly ovate-orbicular to obo-

* *U. S Dispensatory*, 17th ed., p. 1739.

vate 1½ to 3 in. long, rounded or obtusely pointed at apex, thick, coriaceous, with revolute margin, irregularly spinose-dentate or entire, puberulous when young but at maturity glabrous, of a yellow-green color, paler beneath, with broad thick midrib, prominent veins and stout thick puberulous petioles about ½ in. in length. *Flowers* (Feb. to April) dicœcious or polygamo-dicœcious, about ¼ in. across in short dense puberulous racemes which form terminal panicles 1-3 in. in length; pedicels short and each furnished with from two to four ciliate bracts; sepals concave, rose-colored, with ciliate margin; petals about twice as long as the sepals, rose-colored, ciliate and reflexed; stamens as long as petals, with slender filaments and pale yellow anthers; pistil pubescent with broadly ovoid ovary and three-lobed capitate stigma. *Fruit* a red flattened subglobose drupe ½ in. or less in length, very viscid-pubescent, tart in flavor and containing a flattened kidney-shaped brown thick-walled stone.

(The specific name is from the Latin *integer*, *entire*, and *folium*, *leaf*.)

A small evergreen tree with low wide top of straggling branches, the lowermost often reclining upon the ground, and all forming a dome of foliage. In its center is found a short thick trunk, sometimes 2 or 3 ft. (0.7 m.) in diameter, covered with a reddish-gray bark which flakes off in rather small irregular scales. It sometimes attains the height of 30 ft. (9 m.). It is commonly only a wide impenetrable bush, and when in exposed places close to the coast seeming like a bank of foliage smoothly trimmed from the ground up, and when these banks are bestrewn with its many waxen rose-colored panicles of honey-scented flowers, or later with its bunches of viscid red drupes, it is a very handsome object.

HABITAT. — This Sumach is found along the Pacific Coast from near Point Conception into Lower California, and on some of the off-lying islands, attaining its greatest development in Lower California.

PHYSICAL PROPERTIES. — Wood heavy, hard, strong, with fine grain and susceptible of a smooth polish; the heart is of a salmon pinkish color, lemon-yellow near the thin white sap-wood of eight or ten annual layers. *Specific Gravity*, 0.7830; *Percentage of Ash*, 0.20; *Relative Approximate Fuel Value* 0.7815; *Weight of a Cubic Foot in Pounds*, 48.80.

USES. — Little use is made of this wood save for fuel for which it is very useful in regions where it abounds. The species is well worthy of prominent rank, however, for ornamental purposes. A pleasant refrigerant drink is made from the fruit as with the allied *Rhus ovata*.

MEDICINAL PROPERTIES are not recorded of this species, though the beverage made from the fruit might suggest its usefulness in this direction.

180. RHUS LAURINA, NUTT.

LAUREL SUMACH, SUMACH

Ger., *Lorberblättriger Sumach;* Fr., *Sumac de laurier;* Sp., *Zumaque de laurel.*

SPECIFIC CHARACTERS: — *Leaves* simple, persistent, coriacious, 2½–5 in. in length, the petiole about half as long as the blade, which is ovate-lanceolate to oblong, obtuse or rounded and mucronate at apex, rounded at base, entire, glaucous. *Flowers* perfect or polygamous, small (about a line in length), yellowish, in dense ample terminal or axillary compound panicles, 2–4 in. long. *Fruit* a small oblong ovoid-globose whitish glabrous drupe, scarcely ¼ in. in length, beaked with the stout styles, with thin flesh and hard compressed stone.

(The specific name is an adjective from the Latin, *laurus*, laurel, and refers to the resemblance between the leaves of this species and those of the laurel.)

Generally an evergreen, wide-branched, rather open shrub, but in sheltered places on Santa Catalina Island it attains a height of 25 ft. (7 or 8 m.), with crooked trunk 10 or 12 in. (0.30 m.) in diameter, vested in a thin smooth beech-like bark less than ¼ in. in thickness and of a dark gray color.

HABITAT. — The *Rhus laurina* is found along the coast from Santa Barbara southward into Lower California, growing on the mesas and hills near the coast and on the off-lying islands.

PHYSICAL PROPERTIES. — Wood quite soft, light, not strong, with quite uniformly distributed ducts and susceptible of a smooth polish. Specific gravity, etc., we believe, have not been determined. The largest trunks we have been able to find have contained no heart-wood; hence we are unable to show or describe that. They consisted entirely of sap-wood, which is of a pinkish-white color, darkest at the rings, and showing quite rapid growth.

GENUS HETEROMELES, ROEMER.

Leaves persistent, simple, alternate, 2–4 in. long, coriacious, obovate to oblong-lanceolate, tapering at both ends, margin remotely serrate with sharp glandular teeth, or occasionally almost entire, dark shining green above, paler beneath, with stout grooved petioles and broad mid ribs grooved above and often with one or two glandular teeth near the blade; stipules, subulate and early deciduous; branchlets and leaves at first puberulent. *Flowers* (June to August) regular, perfect, in ample terminal corymbose panicles, 4–6 in. across, with caducous bracts; calyx with turbinate tube more or less tomentose below and with short triangular spreading persistent globes imbricated in æstivation; petals 5, broad, white, emarginate or minutely lobed at apex and inserted near the edge of the calyx tube; stamens 10, inserted in a single row with the petals, with subulate incurved filaments, and emarginate introrse 2-celled anthers opening longitudinally; pistil consisting of two carpels united with each other and with the calyx tube below; styles distinct, with terminal truncate stigmas, ovary 2-celled, each cell containing two ascending anatropous ovules. *Fruit* (ripe in Nov. and Dec.) scarlet, obovoid or subglobose fleshy drupe-like berry, mealy and astringent in flavor, and formed by the thickening of the calyx tube connate with the membranaceous carpels below the middle but free above, and with the calyx lobes which close in over the

upper hairy ends of the carpels and their tips turning outward crown the summit; seeds usually solitary in each cell, ovate lenticular, slightly ridged on the back, with membranaceous light brown puncticulate testa and a conspicuous hilum, no albumen.

The genus consists of the single following species and its name is derived from the Greek ἕτερος, *different*, and μῆλον, *fruit*, alluding to the difference between this fruit and that of the allied genera.

181. HETEROMELES ARBUTIFOLIA, ROEMER.

CHRISTMAS-BERRY, CALIFORNIA HOLLY, TOYON, TOLLON.

Ger., *Christfestbeere;* Fr., *Houx de Californie;* Sp., *Tollon.*

The Christmas-berry is a small round-topped tree, sometimes 30 ft. (9 m.) in height, with a trunk 18 in. to 2 ft. (0.50 m.) in diameter, vested in a rather thin light-gray bark, mottled with whitish, which becomes fissured with age and reticulated by firmly adherent ridges. Or it is often found fruiting as a shrub. It is a particularly beautiful object when laden with its bunches of light-red berries, which contrast strongly with its shining dark green foliage.

HABITAT. — The coast region of California, along slopes and the borders of streams, from Mendocino Co. to Lower California, and on the islands off the coast, where it attains its greatest development. It extends eastward to the foothills of the Sierra Nevada and San Bernardino Mountains.

PHYSICAL PROPERTIES. — Wood heavy, hard, strong, close-grained, susceptible of a satiny polish, and often with a handsome mottled figure. It is of a reddish-buff color, light near the bark, but gradually darkening to the chocolate-brown heart-wood. *Specific Gravity*, 0.9326; *Weight of a Cubic Foot in Pounds*, 58.12.

USES. — Very little use is made of the Tollon, save for Christmas decorations in California, for which its large bunches of bright scarlet berries and shining dark green foliage make it very popular.

The highly ornamental value of the tree, especially when in fruit, should give it high rank for ornamental purposes in parks and gardens.

MEDICINAL PROPERTIES. — Tannic, gallic, and hydrocyanic acids have been found in this plant.*

ORDER SAXIFRAGACEÆ: SAXIFRAGE FAMILY.

Leaves simple or compound, alternate or whorled, with or without stipules. *Flowers* perfect and mostly regular; sepals usually five, connate or distinct; corolla of distinct petals, alternating with the sepals (or very rarely wanting); stamens five, alternate with the petals, or double the number and inserted with them on the calyx-tube; pistil with ovary superior, carpels usually two united or

* *U. S. Dispensatory*, 17th ed., p. 1652.

rarely three; styles free or united at base and with terminal stigmas; ovules numerous, anatropous. *Fruit* capsular, rarely indehiscent, and more rarely fleshy with albuminous seeds.

Order consists of herbs, shrubs and trees of many species and wide distribution.

GENUS LYONOTHAMNUS, GRAY.

Leaves opposite, persistent, coriacious, 3–8 in. long, lanceolate, acuminate, rounded or wedge-shaped at base, long petiolate, simple or variously parted into from 2–8 remote segments, entire, irregularly crenate serrate or serrate-lobate (sometimes all on the same branchlet), smooth, dark-green above, lighter and more or less pubescent beneath, with prominent straight midribs, and very small transverse parallel lateral veins; stipules minute and caducous; branchlets at first pale or orange color and covered with pubescence which soon disappears, and they are then smooth and of a reddish color. *Flowers* (June to July) perfect, in broad compound terminal pubescent cymes, 4–8 in. or more across, with minute persistent acute bracts and bractlets; calyx 1–3 bracteolate, with nearly triangular persistent lobes, imbricated in æstivation; petals 5, white, nearly orbicular and also imbricated in æstivation; stamens 15 inserted on the margin of the disk lining the calyx tube, with incurved subulate filaments as long as the petals and oblong introrse two-celled longitudinally dehiscent anthers; pistils two, superior, with ovoid ovaries flattened on contiguous sides and glandular pubescent; style short, with capitate stigma; ovules four suspended in each cell, anatropous. *Fruit* (ripe in August and September) an ovoid glandular woody follicle arranged in pairs, $\frac{3}{16}$ in. long, dehiscent along the ventral suture and partly along the dorsal, liberating its four ovate-oblong light-brown seeds pointed at both ends, with thin testa, broad wing-like raphe and scant albumen.

The genus is represented by the following single species, and is named in compliment to Mr. Wm. S. Lyon of Los Angeles, Cal., who discovered it in 1884.

182. LYONOTHAMNUS FLORIBUNDUS, GRAY.

SANTA CATALINA IRON-WOOD, SANTA CRUZ IRON-WOOD.

Ger., *Eisenholtz von Santa Catalina;* Fr., *Bois dur de Santa Catalina;* Sp., *Arbol de Hierro de Santa Catalina.*

This very interesting tree attains the height of from 30 to 50 ft. (15 m.), with straight trunk usually ridged and fluted, 12-14 in. (0.35 m.) in diameter, vested in a reddish-gray bark which exfoliates in long strips, similar to that of old Grape vine trunks, revealing purple-brown papery layers beneath. With small graceful branches and rather open foliage the tree has a very characteristic appearance, and when adorned with its broad cymes of white flowers terminating each branchlet is a beautiful object.

HABITAT. — Found only on the islands of Santa Cruz, Santa Catalina and Santa Rosa, growing in small, very exclusive groves along the slopes and ridges near the bottoms of cañons, rarely, if ever, growing singly or scattered to any extent among other trees. The exclusive nature of the species, at least as I have seen it on Santa Catalina Island, is singularly interesting, the patches of foliage produced by the small groves scattered here and there along the cañons being very conspicuous as looked down upon from a commanding summit.

PHYSICAL PROPERTIES. — The wood is very heavy, quite hard, close-grained, with fine medullary rays, and susceptible of a good polish. It is of a pinkish buff color, the heart-wood striped and mottled with purplish brown, and ample sap-wood mottled with orange. *Specific Gravity*, 0.8029; *Relative Approximate Fuel Value*, 0.7988; *Percentage of Ash*, 0.51; *Weight of a Cubic Foot in Pounds*, 50.05.*

USES. — Little use is made of this tree, though it will doubtless find the place in ornamental planting or for potting in green houses to which the beauty of its flowers and singularity of its foliage entitle it.

MEDICINAL PROPERTIES are not known of this species.

ORDER **MYRTACEÆ**: MYRTLE FAMILY.

Leaves simple, opposite or alternate, without stipules, often pellucid-punctate, coriacious and with marginal vein. *Flowers* usually perfect; calyx-lobes valvate or imbricate or consolidated into a lid; petals 4 or 5 (rarely 6 or wanting) epigynous; stamens numerous; ovary usually inferior (rarely free) 2-many celled (rarely 1-celled), styles undivided; ovules 2 or many, amphitropous. *Fruit* a capsule or berry; seeds without albumen.

A large and important order of about 1800 species, mostly of trees and shrubs of warm climates, generally pervaded with a fragrant and pungent volatile oil and producing various spices, edible fruits, etc.

GENUS EUCALYPTUS, L'HERITIER.

Leaves thick, coriacious, smooth, mostly alternate though on young shoots generally opposite, entire or nearly so, with thick margin, opposite sides generally alike and arranged vertically by a twist in the petiole, glandular-punctate and of marked flavor and odor when bruised. *Flowers* in 3–15-flowered umbels or solitary in the axils of the leaves, with firm cup-like calyx which opens with a deciduous lid; petals wanting; stamens very numerous, with slender filiform filaments incurved in æstivation and conspicuously crowning and radiating from the edge of the cup after the lid falls away, and with small introrse anthers; ovary inferior with several cells containing numerous ovules on axial placentæ. *Fruit* a firm woody cup-like, capsule loculicidally dehiscent at the top when mature and liberating many abortive and perfect seeds.

A very interesting and important genus of nearly 150 species of trees, confined in a native state to Australia and the neighboring islands, some of great economic value and among them there are giants attaining the great height of 400 ft. and upwards — the only rivals of our great Sequoias in size. The name *Eucalyptus* is from the Greek, εὖ, *well*, and, καλύπτειν, *to cover*, alluding to the stamens being well covered by the lid.

183. EUCALYPTUS GLOBULUS, LABILL.

EUCALYPTUS, BLUE GUM, GUM-TREE.

Ger., *Eucalyptus*; Fr., *Eucalyptus*; Sp., *Eucalyptus*.

Leaves variable to the extreme on the same tree, those of young trees to the height of ten or fifteen feet and those on the lowermost branches to about the same height on larger trees, being opposite, sessile, ovate-oblong, heart-shaped at base, 4-8 in. long and 2-4 in. broad, very glaucous blue-green, erect and horizontally disposed upon the branchlet, which is strongly four-angled and glaucous

* *Garden and Forest*, Vol. III, p. 344.

blue-green. The leaves on the upper branches, and constituting the bulk of the foliage of large trees, are alternate, petiolate, linear-lanceolate and more or less falcate, wedge-shaped at base, 6-12 in. long and ¾–2 in. broad, not glaucous, of a yellow-green color, pendent and vertically disposed on the branchlet by a twist in the petiole. *Flowers* large, generally solitary in the axils of the leaves, with thick flattened peduncle about as long as broad; young operculum conical, the length of the four-sided cupule. *Fruit* a top-shaped capsule about an inch long and broad, glaucous and with four longitudinal ridges outside (hence somewhat four-sided) nearly flat above but depressed and mucronate in the middle, dehiscent at maturity by a slit near the center on top at the summit of each of the four or five cells, and through these are liberated the black angular irregular fertile seeds, about one line in diameter, and a considerably larger number of brown compressed linear sterile seeds.

The specific name is the Latin, *globulus*, given to this species on account of its "button-shaped" capsules.

This very interesting tree in the forests of its native land attains the great height of 400 ft. (120 m.), with straight columnar trunks 14-16 ft. (5 m.) in diameter. In California it has not yet had time to attain such dimensions, but the climatic conditions seem perfectly adapted to it, and it may attain such dimensions here in time. Such is its marvelous rapidity of growth that trees in San Jose, Cal., for example, known to be only ten years old, have been found to be eighteen inches in diameter of trunk and in the vicinity of 80 or 90 ft. high.* The young trees, until 10 or 15 ft. in height, present "a finished type of elegance," exclusively with rich glaucous foliage, its bluish cast being a very conspicuous feature. As the tree grows older the narrow sickle-shaped yellowish-green leaves appear at the summit, and in time these constitute the bulk of the foliage. Its two kinds of leaves give it a very singular appearance. The tree develops a tall, narrow and generally irregular head, sometimes almost spire-shaped, and, owing to the vertically arranged upper leaves, which present a minimum amount of surface to the sun's rays, casts but little shade. The bark of the trunk is of a mottled grayish-brown color, smooth and thin, owing to the annual exfoliation of the outer layers which fall off in long strips and irregular plates, leaving a yellowish-brown inner bark, which gradually darkens on exposure to the light.

HABITAT. — The native home of the Blue Gum is southern Australia and Tasmania, whence it has been extensively introduced into the warmer parts of Europe, Asia and America. In California it is very extensively planted and thrives wonderfully throughout the state generally, where the temperature does not fall much below the frost mark, and it has become naturalized in places.

PHYSICAL PROPERTIES. — The wood is quite heavy, hard, strong, with many fine open ducts, with both annular rings and medullary

* *Forest Culture and Eucalyptus Trees.* By Elwood Cooper, p. 20.

rays rather obscure, very durable in contact with sea water and difficult to split owing to an interbraiding of the fibers. It is of a grayish-brown color, with lighter sap-wood.

Uses. — The wood is little used in this country, save for fuel, for which it is excellent. This fact, together with the rapidity of growth of the tree, make it pre-eminently the fuel tree for the regions in which it thrives best, and which happen often to be regions most poorly supplied with native trees; hence, most in need of it. In its native land the wood of the Blue Gum is highly prized for various construction purposes. The value of the tree for ornamental planting, and especially for wind-breaks, is of great importance, and it has been found of hygienic value for planting in malarial regions, the miasma being counteracted by its presence. So strongly is this attribute appreciated in Southern Europe, where it is extensively planted for reclaiming malarious marsh-lands, that it is known there as the Fever-tree. Its presence greatly diminishes the number of cases of fever and ague.

A decoction of the leaves is used to cut the rust in steam boilers.

Medicinal Properties. — A volatile oil is extracted from the fresh leaves by distillation and this applied locally acts as a powerful irritant. Taken internally, it is a stimulating narcotic and has been used with asserted success in migraine and other forms of neuralgia. As an antispasmodic it has been highly lauded in asthma, for which affection it is best given by inhalation. Cigarettes made of the dry leaves are sometimes smoked or the vapor from boiling water containing the oil is inhaled for the same affection. It is often employed to advantage in bronchitis. It is claimed also to have superior antiseptic properties; hence its usefulness applied externally with chronic skin affections and ulcerations where a stimulant antiseptic application is indicated.*

Order **CACTACEÆ**: Cactus Family.

Leaves generally wanting, sometimes minute and deciduous (rarely perfect, flat, and petiolate); stems green, fleshy, covered with tubercles, cylindrical, flat, or variously angled, channelled or winged, elongated, simple or branched or globose, with thick usually green bark and loose cellular tissue, without stipules, usually furnished with remarkable spines springing in fascicles from ariolæ in the axils of leaves or absent leaves. *Flowers* perfect, usually solitary, often large and showy, ephemeral; sepals numerous, the inner petal-like, united below for considerable length into a tube adnate to the ovary; petals delicate, in two or more rows united below with the sepals; stamens numerous in several rows, with long filiform filaments and introrse two-celled longitudinally dehiscent anthers; ovary inferior, one-celled with parietal placentæ and numerous anatropous ovules; style simple, elongated and stigmas as many as the placentæ.

* *U. S. Dispensatory*, 17th ed., p. 516-517.

Fruit a pulpy umbilicate berry, smooth or furnished with spines and containing numerous seeds, with or without albumen, buried in the pulp.

A large order of few genera, but many species, of plants of very peculiar aspect, confined quite exclusively to the American continent, natives of dry arid regions and most abundant in or near the tropics.

GENUS OPUNTIA, TOUNREFORT,

Leaves small, subulate, on the young branches and early deciduous. *Flowers* yellow, red or purple, sessile and solitary, on the joints of the previous year, springing from the ariolæ which produce the spines, with short cup-shaped tube; calyx-tube not produced beyond the ovary, lobes numerous; petals spreading or half erect; stamens shorter than the petals; ovary bearing bristles in the axils of the deciduous sepals. *Fruit* succulent and often edible, pear-shaped or barrel-shaped berries, truncate, with wide umbilicose apex, bearing small and easily detachable spines in the ariolæ and containing large white compressed seeds having embryo coiled around the albumen; cotyledons large and foliacious.

Fleshy, articulated and much-branched plants, low and prostrate or erect and shrub or tree-like with stems quite terete at base and branches flattened or terete and bearing in ariolæ numerous minutely barbed spines and bristles. A large genus of one hundred and fifty or more species, natives of America, but some have become widely naturalized in the old world. *Opuntia* is from the name of a Greek town, Ὀπούς, near which some cactus-like plants were mentioned by Pliny as growing.

184. OPUNTIA TUNA, MILL.

MISSION CACTUS. INDIAN FIG. PRICKLY PEAR.

Ger., *Indische Feige;* Fr., *Figue d' Indien;* Sp., *Tunal.*

SPECIFIC CHARACTERS: — Joints of the branches flat and obovate to oblong with rather distant fascicles of stout yellow spreading unequal minutely barbed spines. *Fruit* rich carmine within, 2-4 in. long and furnished with minute prickles, edible.

(*Tuna* is the Spanish name of the fruit of the Indian Fig.)

An erect or inclining Cactus, sometimes 15 ft. (4.50 m.) in height, with branches formed by the wide flat joints, armed with strong yellow spines, sometimes 2 in. in length, and short cylindrical but still-jointed trunk, sometimes 12 or 18 in. (0.40 m.) or more in diameter. In thickets of the Cactus the trunk is longer, sinuous and partially procumbent.

HABITAT. — The native home of the *Opuntia Tuna* is South America and the West Indies. It has been extensively introduced, however, into southern Europe and other warm regions. It was early planted about the old missions of southern California, and has there become naturalized, springing occasionally from seed and often from detached joints which have been dumped in waste places and there take root.

PHYSICAL PROPERTIES. — Wood of very loose open structure, really a framework, with intervals filled with a thick viscid, colorless fluid,

which disappears when the stems are cut and dried, and only the framework remains. These skeletons of cactus stems and leaves, some of them beautiful specimens of filagree, persist for a time after the plant has died, bleached white and bestrown over the ground of the cactus regions.

USES. — The principal use of the *Opuntia Tuna* with us is for ornamental planting and for hedges, and most effective barriers do they make, owing to their many strong and exceedingly sharp spines. They were quite generally planted about mission walls in southern California in early days, and we can imagine invading Indians must have considered it worse to pass than the adobe wall itself. The plant has also been used extensively for hedges in southern Europe, and we learn that when the Island of St. Christopher was to be divided between the English and French three rows of this cactus were planted by common consent along the boundaries. The fruit is edible but unless the numerous minute hair-like prickles are thoroughly wiped off and rind removed before trying to eat it the barbed prickles are sure to become lodged in the lining of the mouth and annoy one for some days after

This is a favorite species of Cactus for supporting the cochineal insect, an industry principally of Mexico, Central America and the Canary Islands.

MEDICINAL PROPERTIES are not recorded of this species.

ORDER CORNACEÆ: DOGWOOD FAMILY.

Leaves opposite (except in one species) simple, mostly entire. *Flowers* in cymes often involucrate, polypetalous (exceptionally apetalous), 4-numerous; calyx-tube adherent to the ovary, its limb minute; petals valvate in the bud, oblong, sessile and, with the stamens, borne on an epigynous disk in the perfect flowers; ovary 1-celled, bearing a single suspended ovule; style single, somewhat club shaped. *Fruit* a 1–2 seeded baccate drupe, bearing the persistent limb of the calyx.

Trees, shrubs or rarely herbs, with bitter, tonic bark.

GENUS CORNUS, TOURNEFORT.

Leaves opposite (excepting one species, *C. alternifolia*), simple, deciduous, entire, without stipules and clustered at the ends of the branchlets; bud-scales accrescent. *Flowers* perfect (in some foreign species dicœcious), small, 4-numerous, in naked cymes, or in heads surrounded by a corolla-like involucre; calyx with 4 minute segments; petals distinct, oblong, spreading, sessile; stamens exserted, with slender filaments; pistil solitary, with slender style, terminal stigma and inferior ovary; cells usually 2, each containing a single suspended ovule. *Fruit* a small drupe containing a 2-celled and 2-seeded stone; seeds oblong, with embyro straight or nearly so and surrounded with copious albumen.

Trees, shrubs and perennial herbs with bitter tonic bark, chiefly of the northern temperate zone of both hemispheres. (*Cornus* is the Latin for *horn*, in allusion to the hardness of the wood.)

185. CORNUS NUTTALLII, AUDUBON.

WESTERN DOGWOOD. FLOWERING DOGWOOD.

Ger., *Westlicher Hartriegel;* Fr., *Cornuillier occidental;* Sp., *Cornel occidental.*

SPECIFIC CHARACTERS: — *Leaves* involute in vernation, ovate to obovate, 3–5 in. long, faintly crenulate-serrate, acute apex and wedge-shaped at base, tomentose at first but finally puberulent above and pubescent beneath, clustered at the ends of the branchlets, with prominent mid-ribs impressed above, and stout petioles ½ in. or so in length and having large clasping base; branchlets light green and pale tomentose at first, but finally darker and marked with elevated lunate leaf-scars. In autumn the leaves assume brilliant orange and scarlet hues before falling. *Flowers* open in early spring in dense cymose heads which appear the summer before from the axils of the uppermost pair of lateral leaf buds and remain dormant during the winter, while the tree is leafless. They are then hemispherical, about a half inch across, subtended (but not enveloped) by 4 to 6 involucral scales and supported by a stout pubescent peduncle an inch or less in length. When the flowers open the involucral scales are very conspicuous becoming by that time 1½–3 in. long, oblong to obovate or nearly orbicular in outline, entire, thickened and more or less acute at apex, white or tinted with yellow or pink, puberulous and conspicuously 8-ribbed; calyx terete, slightly urceolate, puberulous outside and yellow-green, or in one form light purple, with four reddish purple lobes; petals 4, strap-shaped, rounded at apex and yellow-green or yellow below the middle and purplish above; pistil solitary with columnar style and capitate stigma. *Fruit* (ripe in Oct.) ovoid bright red or orange drupes about a half inch long crowned with the persistent calyx lobes and mutually compressed into a dense subspherical head, with flesh thin and mealy and stone obtuse at both ends, 2 celled (sometimes 1-celled by obliteration of the other) and with a single compressed seed in each cell.

(Species named after the naturalist, Thos. Nuttall, who first distingnished it from the eastern *C. florida.*)

A beautiful tree ordinarily not more than 50 or 60 ft. (18 m.) in height, exceptionally 100 ft. (30 m.), or with trunk more than 2 ft. (0.60 m.) in diameter, with rather slender spreading branches forming a rounded top. The bark of trunk is very smooth, of a gray-brown color mottled whitish in patches. On very large trees it is of a red-brown color checked on the surface into small thin appressed scales.

HABITAT. — From the valley of the Frazer River and Vancouver's Island southward along the coast region of Washington and Oregon to the San Bernardino Mountains in California and along the western slopes of the Sierra Nevada Mountains, thriving in the shade of the coniferous forests and attaining its largest size in the Redwood region of northern California and northward. In the somber gloom of these evergreen forests its showy flowers in springtime, or later its brilliant fruit and orange and scarlet autumnal foliage have a very striking and pleasing effect. No tree of the western forests bears more beautiful or conspicuous flowers than the flower clusters of this tree.

PHYSICAL PROPERTIES. — Wood very heavy, hard, strong, tough, close-grained, with fine medullary rays, and susceptible of a very smooth polish. The heart-wood is of a light red-brown color, which does not generally appear, however, until the tree is upwards of forty or fifty years old, and the abundant sap-wood is of a creamy-white color. *Specific Gravity*, 0.7481; *Percentage of Ash*, 0.50; *Relative Approximate Fuel Value*, 0.7444; *Coefficient of Elasticity*, 103081; *Modulus of Rupture*, 991; *Resistance to Longitudinal Pressure*, 663; *Resistance to Indentation*, 242; *Weight of a Cubic Foot in Pounds*, 46.62.

USES. — Wood valuable for use in turnery, as for tool handles, mallets, etc., and, as with the eastern Dogwood, for metal-spinners' forms. It is also used to some extent in cabinet making.

The highly ornamental nature of the tree would suggest its occupying a foremost rank for decorative purposes, but, as if Nature were covetous of its beauty for the fastnesses of the forests which it naturally adorns, it is difficult of propagation elsewhere, and though repeated attempts have been made to raise it elsewhere in America and in Europe, they have generally met with failure.

ORDER **OLEACEÆ**: OLIVE FAMILY.

Leaves opposite and single or pinnately compound. *Flowers* monopetalous (rarely apetalous or polypetalous); calyx 4-cleft, toothed or entire, or sometimes wanting, corolla regular, 4-cleft (or sometimes 4-petalous, or even wanting altogether); stamens only 2 (or rarely 4); ovary 2-celled with usually two suspended ovules in each cell. *Fruit* fleshy or capsular, containing 4 (or fewer) seeds.

Represented by trees and shrubs.

GENUS OLEA, TOURNEFORT.

Leaves simple and entire or rarely toothed, persistent. *Flowers* small, white, fragrant and in centripetal axillary or terminal clusters; calyx small with induplicate lobes, persistent; corolla funnel-shaped with valvate lobes and short tube; stamens 2 or 1, little exserted; style short and stigma bifid. *Fruit* a subglobose or oblong oily drupe, with 1–2-celled pit, one cell being often abortive, and fleshy albumen.

A genus of about 35 species of trees and shrubs mostly natives of Asia and Africa and the name is the ancient Latin name of the Olive tree.

186. OLEA EUROPEA, LINNÆUS.

OLIVE.

Ger., *Olivenholz;* Fr., *Olivier;* Sp., *Olivo.*

Leaves lanceolate or oblanceolate, stiff, coriacious, 2–4 in. long, mucronate at apex, and gradually narrowing at base to a very short petiole, with entire revolute margin, smooth dark green above, whitish squamose beneath with minute silvery scales; branchlets angular and hoary-squamose. *Flowers* in panicles, lobes of corrola valvate in the bud. *Fruit* an ellipsoidal oily drupe, from about ¾ to

1½ in. in length, of a bluish-black color and astringent bitter flavor only fit to eat after being treated and pickled. It has been greatly improved by cultivation, the fruit of the wild tree being small and comparatively worthless. Many varieties are found in cultivation based mainly upon the quality of the fruit.

A small to medium-sized evergreen tree of willow-like aspect occasionally attaining the height of 40 or 50 ft. (14 m.) with irregular top of few large branches and rather open airy foliage, parti-colored, as the wind turns up the leaves and reveals the white under surfaces in strong contrast with the dark green of the upper surfaces. The trunk is irregular, with ridges, buttresses and burls, and occasionally attains the diameter of 12 to 18 in. (0.40 m.) or more, clothed with thin gray bark scarcely more than ¼ in. in thickness fissured into narrow fibrous thick-scaled ridges. It commences to bear fruit very early, the fourth year from slips or cuttings and the seventh or eighth from the seed, and also lives to very great age.

HABITAT. — The Olive is thought to be a native of Asia Minor, but has been cultivated from the earliest times in Syria and Palestine, and was thence distributed throughout the whole Mediterranean region where it has generally become naturalized. With the founding of the old missions it was introduced into southern California where olive-growing has now become a great and lucrative industry, and the tree has become sparingly naturalized. It thrives in nearly every well-drained soil, even those that are too poor for other fruits, and has a wonderful constitution for withstanding drouth.

PHYSICAL PROPERTIES. — Wood heavy, hard, strong, of very smooth fine grain, with irregular annual rings, minute evenly distributed ducts and fine obscure medullary rays. It is susceptible of a very smooth polish and is of a pink-buff color mottled and streaked with rich orange-brown, which appears in irregular confluent and concentric rings in the transverse section, and the sap-wood is of a very light yellow color.

The wood is much valued in turnery, but the great value of the tree is in its fruit, and it is this which makes it one of the most valuable of trees. The fresh fruit is of a strongly astringent bitter flavor when fresh, and has to be soaked in water containing potash and lime to expel its bitterness before it is fit to eat. It is then bottled and marketed in an aromatized salt pickle. For this use its green fruit has generally been used, though there is a constantly increasing demand for the pickled ripe olives.

Olive oil, which is the lightest of the fixed non-drying oils, is obtained from the pulp of the ripe fruit by expression. So rich

is the fruit in this oil that a single old Olive tree in the Levant is recorded as having produced in a single season 240 quarts of oil.

A gum-resin exuding from the old trunks has an odor like vanilla and is used in Italy as perfumery.

MEDICINAL PROPERTIES. — Olive oil is much used in medicines, mainly as a constituent of liniments, ointments, cerates and plasters, and as a vehicle or diluent of more active substances. It is occasionally given as a feeble purgative in cases of irritable intestines, and is also useful when taken in larger quantities to involve acrid and poisonous substances and mitigate their action. Externally applied, it is useful in relaxing the skin and in sheathing irritated surfaces from the air.*

GENUS FRAXINUS, TOURNEFORT.

Leaves petioled, oddly-pinnate, with 3–15 toothed or entire leaflets. *Flowers* small, racemed or panicled, from the axils of the last year's leaves, the American representatives dicœcious and apetalous; calyx and corolla, when present, as described for the order; anthers large, linear or oblong; style single, stigma 2-cleft. *Fruit* a 1–2-celled, flattened samara, winged at the apex, 1–2 pendulous seeds in each cell.

(The ancient Latin name of the Ash; supposed to be from the Greek φράξις, *a separation*, alluding to the facility with which the wood splits.)

187. FRAXINUS OREGONA, NUTT.

OREGON ASH.

Ger., *Oregonische Esche;* Fr., *Frêne d'Oregon;* Sp., *Fresno de Oregon.*

SPECIFIC CHARACTERS: — *Leaves* more or less tomentose (sometimes becoming glabrous when old) 5-14 in. long, with 5–7 oval to oblong sessile or subsessile leaflets (the terminal petiolulate), acute, entire or nearly so, 3–7 in. long, gradually narrowing at base, light green above, paler beneath. *Flowers* appear in April or May, as the leaves unfold, dicœcious, in compact glabrous panicles, the scarious rounded bracts early deciduous; calyx of the staminate flower minute, that of the pistillate flower lacineate; stamens two with short filaments and oblong apiculate anthers; style stout and conspicuously 2-lobed. *Fruit* 1–2 in. long, clavate, marginless at base, gradually margined above and preduced into a wing rounded and variously emarginate or apiculate at apex.

A fine tree, sometimes 80 ft. (24 m.) in height, with symmetrical top of stout branches and columnar trunk 3 or 4 ft. (1 m.) in diameter. The bark of trunk is of a dark grayish-brown color, fissured into broad ridges and exfoliating in thin scales.

HABITAT. — The Oregon Ash is found throughout western Washington, Oregon and the coast region of California as far south as the vicinity of San Francisco, and along the western bases of the Sierra

* (*U. S. Dispensatory*, 17th edition, p. 956.)

Nevada Mountains to the southern part of the state, growing in bottom-lands and along the borders of streams.

PHYSICAL PROPERTIES. — Wood heavy, hard, quite strong, coarse-grained, with thin medullary rays and with annual rings marked by a conspicuous band of large open ducts. It is of a brownish color, with abundant lighter sap-wood. *Specific Gravity*, 0.5731; *Percentage of Ash*, 0.34; *Relative Approximate Fuel Value*, 0.5712; *Coefficient of Elasticity*, 84818; *Modulus of Rupture*, 665; *Resistance to Longitudinal Pressure*, 520; *Resistance to Indentation*, 166; *Weight of a Cubic Foot in Pounds*, 35.72.

USES. — One of the most useful of the deciduous-leaved trees of the Pacific states. The wood of the Oregon Ash is extensively used in the manufacture of furniture and interior finishing, in cooperage, for the frames of vehicles and for fuel. It is also of value as a shade tree for street planting.

ORDER **SOLANACEÆ**: NIGHTSHADE FAMILY.

Leaves alternate (the uppermost generally geminate), without stipules. *Flowers* perfect and regular or nearly so, 5-numerous; calyx-lobes persistent; corolla monopetalous, hypogenous; stamens of the same number as the corolla-lobes and inserted on them; ovary 2-celled with very numerous ovules on axial placentæ; style simple and with simple stigma. *Fruit* a 2-celled capsule or berry containing many amphitropous or campylotropous seeds with fleshy albumen.

A large and important order of mostly herbs but some shrubs (erect or climbing) and fewer trees. Most of the representatives are pervaded by a narcotic poison, yet some of the repsesentatives, as the potato, tomato, etc., are among our most important food-plants. Some are of great medicinal value.

GENUS NICOTIANA, TOURNEFORT.

Leaves simple, entire or rarely sinuate-lobed. *Flowers* generally in terminal racemes or panicles, the lowermost sometimes solitary in the axils; calyx campanulate or oblong, 5-cleft, persistent; corolla various, funnel-form or salver-form, usually with a long tube and the 5-toothed limb plaited and convoluted in the bud; stamens mostly included and with stout anthers opening lengthwise; pistil with long style and capitate or depressed stigma somewhat 2-lobed. *Fruit* a smooth 2-celled capsule, closely invested by the persistent calyx, with broad axial placentæ bearing numerous minute seeds and dehiscent at maturity by two to four valves from the apex.

An extensive genus of mostly rank, viscid, pubescent, acrid-narcotic annual herbs, but few somewhat woody at base, and one a glabrous small tree. The name is after Jean Nicot who lived in the 16th century and is reported to have sent the first tobacco to Queen Catherine de Medici who soon acquired a taste for it.

188. NICOTIANA GLAUCA, GRAH.

TREE TOBACCO, WILD TOBACCO.

Ger., *Baumischer Tabak;* Fr., *Tabac d'arbre;* Sp., *Tabaco de Arbol.*

SPECIFIC CHARACTERS: — *Leaves* persistent from broad-ovate to lance-oblong, 3-6 in. long, with long petioles more than half as long as the blade, mostly acute at apex and cuneate or rounded at base, sometimes subcordate, glaucous, as are also the branchlets. *Flowers* in lax slender terminal panicles, the lowermost flowers from the axils of leaves, the others mostly from the axils of small subulate bracts; calyx tubular, campanulate, about ½ in. long, with 5 unequal sharp teeth; corolla greenish yellow, pubescent outside, tubular, 1–1½ in. long, contracted below the very short cup-shaped limb and with five very short segments. *Fruit* an oblong-ovoid, 2-valved capsule, about ½ in. or less in length, closely invested by the persistent calyx, dehiscent septifracally from the apex by two valves each again splitting down loculicidally part way and the placental column is left in the center with its numerous minute oblong seeds about ½ line in length.

The specific name, *glauca*, is a Latin word descriptive of the *blue-green* color of the leaves and branche-

A small tree, quite distinct on account of its slim top, straight wand-like branches, with sea-green bark and sparse glaucous foliage.

It occasionally attains the height of 20 ft. (6 m.), with a trunk 8 or 10 in. (0.25 m.) in diameter, having a rather thin brown bark fissured into irregular plates and papery scales.

HABITAT. — The *Nicotiana glauca* is a native of Buenos Ayres. It has been introduced into southern California, presumably for ornamental purposes, and has become thoroughly naturalized, at least in the Coast region, and is common along streams, bottom-lands and neglected lots in the vicinity of towns.

PHYSICAL PROPERTIES. — Wood light, soft, brittle, with minute regularly arranged open ducts and fine medullary rays. It is of a brownish yellow color, with lighter sap-wood.

USES. — We know of no use to which this tree is applied save for ornamental planting. Its leaves are in no way suitable as a substitute for tobacco, as its name and affinities might imply.

ORDER EUPHORBIACEÆ: SPURGE FAMILY.

Leaves alternate, mostly simple and with fungacious stipules. *Flowers* monœcious or dioecious, sometimes without floral envelopes; calyx, if present, gamosepalous; corolla polypetalous or monopetalous, hypogenus or perigenous, or commonly wanting, imbricated or twisted in æstivation; stamens 1 to many with globose or didymous anthers; pistil with free usually 3-celled ovary (rarely 1 to 2 or several-celled) with a single or pair of anatropous ovules suspended from the summit of each cell. *Fruit* a capsule mostly 3-celled and 3-lobed, the lobes elastically separating from a persistent axis and then loculicidally splitting into two valves; seeds anatropous, crustaceous, with large straight embryo, broad cotyledons and rather scant albumen.

A very large and important order of over 3,000 species of herbs, shrubs and trees, usually with milky, acrid juice. About half of the representatives belong to tropical America and some yield valuable medicines, others active poisons and others important foods.

GENUS RICINUS, TOURNEFORT.

Leaves alternate, large (often a foot or two across) peltate and palmately seven to many-lobed, lobes unequally serrated. *Flowers* monoecious, disposed in long, glaucous, sub-paniculate racemes at the ends of the branches, short pediceled, the staminate clustered above pistillate flowers; calyx in the staminate flowers closed in the bud, in the pistillate sheath-like, cleft and very caducous; petals wanting in both sorts of flowers; stamens very numerous, with crowded branched filaments, each branch bearing two separate roundish anther-cells; ovary 3-celled with 2-cleft plumose styles and a single ovule in each cell. *Fruit* a subglobose smooth or prickly capsule, hardly 1 in. in diameter and dehiscent septicidally from the base into three cells (cocci) which in turn are dehiscent loculicidally and from each is liberated a large compressed oblong seed, with smooth crustaceous brown and white testa, terminal hilum, fleshy albumen and broad flat cotyledons.

A genus of the single following species (of which, however, there are several garden varieties) and the name, *Ricinus*, is the ancient Latin name of a tick which insect the seeds of this plant are said to resemble.

189. RICINUS COMMUNIS, L.

CASTOR-BEAN TREE. PALMA CHRISTA.

Ger., *Ricinusbaum;* Fr., *Arbre de Ricin;* Sp., *Arbol de Ricino.*

The Castor Bean Tree, or the Castor Oil Plant as it is commonly known, is remarkable in that in temperate climates it is an herbaceous annual, blossoming and maturing its fruit the first year, but in tropical and sub-tropical regions it becomes a woody perennial — a veritable tree. It sometimes attains the height of 20 or 30 ft. (7.50 m.) with broad, rounded, full top and trunk sometimes a foot (0.30 m.) in diameter, with quite thin smooth gray bark.

As an annual, throughout the greater part of the United States, it is a vigorous stately plant from 3 to 10 feet in height, of a striking and highly ornamental aspect on account of its symmetrical form, large peltate leaves and conspicuous flower clusters. In its tree form it is scarcely less ornamental, though there the leaves do not often attain the maximum dimensions.

HABITAT. — The native home of the Castor Bean is thought to be either tropical Africa or tropical Asia, but so abundantly has it been planted and become naturalized throughout all warm countries that it is a point difficult to determine. It is thoroughly naturalized in southern California, growing luxuriously in rich bottom-lands, especially in the vicinity of Los Angeles and San Pedro.

PHYSICAL PROPERTIES. — Wood very light, soft, not strong, of rapid growth, with quite large evenly distributed open ducts, obscure annual rings and fine medullary rays. The heart-wood is of a mottled brown color, and the sap-wood is nearly white, green-tinted near the bark.

USES. — The great economic value of the *Ricinus communis*, and for which the plant is extensively grown in warm countries, is the valuable fixed oil which is expressed from its seeds. This is used chiefly in medicine, but is also valuable as a lubricant and formerly was used as a luminant. Some years ago the streets of Lima, Peru, it is said, were lighted by it, and the machines used in the works of the sugar plantations of Peru were lubricated by it. The Castor Bean is very popular for ornamental gardening for which it is admirably adapted, as it springs quickly from the seed and soon becomes a large and beautiful plant of tropical aspect.

MEDICINAL PROPERTIES. — Castor Oil, expressed from the seed, is a mild and speedy cathartic, decidedly the best and safest cathartic, as a general rule, for children.

ORDER **JUGLANDACEÆ**: WALNUT FAMILY.

Leaves alternate, pinnate and without stipules. *Flowers* monœcious and apetalous, except in some cases in the fertile flowers. *Sterile flowers* in catkins with an irregular calyx adnate to the scale of the catkin. *Fertile flowers* solitary or in small clusters, with calyx regularly 3-5-lobed, adherent to the incompletely 2-4-celled, but 1-ovuled ovary. *Fruit* a sort of dry drupe (a tryma), with a fibrous and more or less fleshy and coriaceous outer coat very astringent to the taste, a hard, bony inner coat, and a 2-4-lobed seed, which is orthotropous, with thick, oily and often corrugated cotyledons and no albumen.

All representatives of the order are trees.

GENUS JUGLANS, L.

Leaves odd-pinnate, with numerous serrate leaflets; leaf-buds few-scaled or nearly naked. *Sterile flowers* in long, simple, imbricated, axillary catkins from the wood of the preceding year; calyx unequally 3-6-cleft; stamens 12-40 with very short and free filaments. *Fertile flowers* several in a cluster or solitary at the ends of the branches; calyx 4-toothed and bearing in its sinuses 4 small petals; style 2, very short; stigmas 2, somewhat club-shaped and fringed. *Fruit* drupaceous with a fibrous and spongy, somewhat fleshy, indehiscent epicarp and a rough irregularly furrowed endocarp; embryo edible and wholesome.

Trees with strong-scented resinous-aromatic bark and a pith which separates into thin transverse disks. (*Juglans* is contracted from Latin *Jovis glans, the nut of Jove.*)

190. JUGLANS CALIFORNICA, WATSON.

CALIFORNIA WALNUT.

Ger., *Californische Wallnussbaum;* Fr., *Noyer de Californie;* Sp., *Nogal de California.*

SPECIFIC CHARACTERS: — *Leaves* 6-9 in. long and composed of 11 to 17 ovate-lanceolate somewhat falcate acuminate serrate leaflets, 1½–3 in. in length and with short stout petiolules. *Staminate flowers* (opening in April and May after the stigmas of the pistillate flowers have begun to wither) in slender puberulous aments, 2–3 in. long, the 6-lobed perianth elongated, light green and as with the bract rufous-pubescent outside; stamens 30–40 with yellow anthers and connect-

ive bifid at apex. *Pistillate flowers* ovate-globose, $\frac{1}{8}$ in. long, puberulous, calyx lobes broad-ovate, pubescent and subtended by a ring-like border of short bracts; stigmas club-shaped, $\frac{1}{2}$ in. long, yellow. *Fruit* globose, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, with thin dark brown pubescent husk, which being removed reveals a subglobose dark-brown nut, slightly compressed, without sutural ridges but with remote shallow grooves. It is four-celled at base, rather thin walled and contains a large sweet kernel.

Generally a small tree with few stout branches forming a rounded or broad head, and sometimes hardly more than a shrub, but occasionally it attains the height of 50 or 60 ft. (16 m.), with trunk 18 in. (0.50 m.) or more in diameter. The bark of trunk of a gray-brown color is rather fibrous within, fissured into flat longitudinal ridges which exfoliate in thick plate-like scales.

HABITAT. — The California Walnut is found along the Coast region of California from a little north of San Francisco southward to the southern slopes of San Bernardino Mountains, preferring the banks of streams and rich bottom-lands.

PHYSICAL PROPERTIES. — Wood rather heavy and hard, of moderate strength, easy to work, with rather large, quite uniformly distributed open ducts, and small obscure medullary rays. It is of a dark purple-brown color, sometimes handsomely mottled, and with thick yellowish white sap-wood, which, however, soon after being cut assumes a markedly green cast, changing afterwards to brownish white color. *Specific Gravity*, 0.4086; *Weight of a Cubic Foot in Pounds*, 25.46.

USES. — The wood is not extensively used, though sound trunks, when large enough, are suitable for such uses as the allied Black Walnut is applied, as in cabinet making, etc. It is often planted as a shade tree. The fruit, though small, is considered, by children at least, as well worth gathering on account of the good edible qualities. They are sometimes planted as young stocks on which to graft the English Walnut.

ORDER **CUPULIFERÆ**: OAK FAMILY.

Leaves alternate, simple, straight veined; the stipules, forming the bud-scales, deciduous. *Flowers* monœcious, apetalous. *Sterile flowers* in clustered or racemed catkins (or in simple clusters in the Beech); calyx regular or scale-like; stamens 5–20. *Fertile flowers* solitary, clustered or spiked, and furnished with an involucre which forms a cup or covering to the nut; calyx-tube adherent to the ovary, its teeth minute and crowning the summit; ovary 2–7-celled with 1–2 pendulous ovules in each cell, but all of the cells and ovules, except one, disappearing before maturity; stigmas sessile. *Fruit* a 1-celled, 1-seeded nut, solitary or several together and partly or wholly covered by the scaly (in some cases echinate) involucral cup or covering; seed albumenless, with an anatrapous, often edible, embryo; cotyledons thick and fleshy.

Genus is represented by both trees and shrubs.

GENUS QUERCUS, L.

Flowers greenish or yellowish. *Sterile flowers* in loose, slender, naked catkins, which spring singly or several together from axillary buds; calyx 2–8-parted or cleft; stamens 3–12; anthers 2-celled *Fertile flowers* with ovary nearly 3-celled and 6-ovuled, two of the cells and 5 of the ovules being abortive; stigma 3-lobed; involucre developing into a hard, scaly cup around the base of the nut or acorn, which is 1-celled, 1-seeded.

(*Quercus* is the ancient Latin name for the Oak supposed to be from the Celtic *quer, fine,* and *cuez, tree.*)

191. QUERCUS TOMENTELLA, ENGELM.

ISLAND LIVE OAK, SANTA CATALINA WHITE OAK.

Ger., *Eiländische Stechpalme;* Fr., *Chêne vert insulaire;* Sp., *Encina de isla.*

SPECIFIC CHARACTERS: — *Leaves* persistent, thick, coriaceous, oblong-lanceolate, from 2 to 4 in. long, acute or occasionally rounded, perhaps cuspidate, at apex, coarsely crenate-dentate with teeth tipped with very small bristles, or entire (often both forms on the same branch) dark bluish green, stellate pubescent above when young, but finally glabrous or nearly so, with prominent mid-rib and veins, beneath lighter and, as with the short petioles and branchlets, densely covered with hoary stellate pubescence; stipules caducous. *Staminate flowers* in stellate-pubescent pendent bracteate aments, 2 in. or more in length, appearing from the axils of young leaves; calyx light yellow, pubescent, 5–7-lobed; stamens 5–10 exserted, with slender filaments and yellow oblong pointed anthers. *Pistillate flowers* subsessile, in the axils of more terminal leaves or on few-flowered axillary spikes; calyx and involucral scales stellate-pubescent; stigma red. *Fruit* subsessile, ripening at the end of the second season, with ovoid nut 1–1½ in. long, the thick shell pubescent within toward the apex, and shallow, thickish woody cup, with thin rim, ¼ to ⅓ enveloping the nut, tubercled and hoary stellate-tomentose outside with small tips of scales free.

A tree of medium size in sheltered cañons, attaining the height of 75 ft. (22 m.) or somewhat more, with trunk 2 ft.(0.60 m.) or less in diameter. The bark of trunk is of a light gray color, quite thin and rough on the old trunks, with longitudinal ridges which flake off in firm scales revealing a red-brown inner bark.

HABITAT. — The *Quercus tomentella* is distinctively an insular Oak, being found only, so far as known, on certain islands off the coast of southern and Lower California. It was discovered "on a bleak crest near the northeast end of Guadaloupe Island," and has since been found on the Californian islands, Santa Cruz, Santa Rosa and Santa Catalina. I have seen it only on Santa Catalina Island, and there found it forming small groves, with a few outlying trees, in a number of sheltered cañons. These groves are conspicuous when viewed from a distance on account of the gray-green tint of foliage and the stature of the trees, as they tower above most of the surrounding vegetation.

PHYSICAL PROPERTIES. — Wood heavy, hard, close-grained, compact, with open ducts arranged in broad bands parallel with the

medullary rays, which are few and small for an Oak. It is of a pale yellow-brown color, with abundant lighter sap-wood. *Specific Gravity*, 0.7214; *Percentage of Ash*, 100; *Relative Approximate Fuel Value*, 0.7142; *Weight of a Cubic Foot in Pounds*, 44.95.

USES. — Not of sufficient abundance to be of commercial importance, though the wood is excellent in quality for the uses to which the Oaks are generally applied.

192. QUERCUS WISLIZENI, A. de C.

HIGHLAND LIVE OAK.

Ger., *Hochländische Stechpalme;* Fr., *Chêne vert montagneux;* Sp., *Encina mantañosa.*

SPECIFIC CHARACTERS: — *Leaves* mostly oblong-lanceolate, but varying from lanceolate to oval, mostly 1–3 in. long, thick, coriaceous, acute or rounded and generally apiculate at apex, truncate rounded or abruptly wedge-shaped at base, entire, sinuate or serrate-dentate with spreading, rigid, bristle-pointed teeth, stellate-pubescent at first, soon glabrous dark green above and somewhat paler and more yellowish beneath; slightly if at all concave beneath; petioles rather slender hoary pubescent at first and usually more or less so at maturity; the cilliate stipules caducous; *Staminate flowers* in hairy aments 2–4 in. long; calyx glabrous with broad cilliate lobes; stamens 3-6, exserted, with slender filaments and yellow apiculate anthers. *Pistillate flowers* are subsessile, with hoary tomentose peduncle and involucral scales; styles often more than three, slender and recurved. *Fruit* ripens in the autumn of the second year, sessile on short peduncles, acorns solitary or few together, with slender taper-pointed chestnut-brown and often striated thin-shelled nut, ¾-1½ in. long and scarcely ½ in. broad at base, sericio-tomentose within; cup thin, turbinate, varying from ½ to 1 in. deep, or sometimes shallow and covered with thin light brown closely imbricated more or less pubescent scales.

The specific name, *Wislizeni*, is given in compliment to Dr. F. A. Wislizenus, an early botanical explorer who gathered the type specimens on which the species was founded.

This beautiful tree attains the height of 75 or 80 ft. (24 m.), with round wide close top of strong spreading branches and dense dark green foliage. The trunk, which is generally short, is occasionally 5 or 6 ft. (1.50 m.) in diameter, and its bark is of a dark brown color, ridged longitudinaliy and covered with firm closely appressed scales. It is a handsome tree and adds not a little to the charms of the landscape scenery in the regions in which it abounds.

HABITAT. — California — from Mount Shasta southward along the foothills of the Sierra Nevada Mountains to the Tehachapi Mountains and among the Coast ranges as far south as Santa Lucia Mountains. In its tree form it is confined to the interior, back some distance from the sea, being supplemented near the coast by the *Quercus agrifolia*, a tree of very similar aspect and with which it was at first confounded.

The Highland Live Oak near the coast and on Santa Rosa and Santa Cruz Islands is of more shrubby habit, and in that form extends southward into Lower California.

PHYSICAL PROPERTIES. — Wood heavy, very hard and strong, quite close-grained, with annual rings more distinctly indicated by large open ducts than is the case with the evergreen Oaks generally, the structure being rather between them and the deciduous species. It is of a light reddish-brown color with abundant lighter sap-wood, the heart-wood in fact only appearing in trees of considerable age. *Specific Gravity*, 0.7855; *Percentage of Ash*, 1.02; *Relative Approximate Fuel Value*, 0.7775; *Coefficient of Elasticity*, 8.6055; *Modulus of Rupture*, 818; *Resistance to Longitudinal Pressure*, 533; *Resistance to Indentation*, 272; *Weight of a Cubic Foot in Pounds*, 48.95.

USES. — The main use of this tree is for fuel, for which it is excellent, but the qualities of the wood are such that it is suitable for various manufacturing purposes as for furniture, agricultural implements, etc. where firmness and strength or ornamental qualities are required.

ORDER SALICACEÆ: WILLOW FAMILY.

Leaves alternate, simple, undivided and furnished with stipules, which are either scale-like and deciduous, or leaf-like and persistent. *Flowers* dioecious, both kinds in catkins, one under each bract or scale of the catkin and destitute of both calyx and corolla, or the former represented by a gland-like cup; ovary 1 to 2-celled; styles wanting, or 2 and short; stigmas often 2-lobed. *Fruit* a 1 or 2-celled, 2-valved pod, with numerous seeds springing from two parietal or basal placentæ and furnished with long, silky down; seeds ascending, anatropous, with albumen; cotyledons flat.

Trees or shrubs of rapid growth, light wood and bitter bark.

GENUS SALIX, TOURNEFORT.

Leaves generally narrow, long and pointed and usually with conspicuous stipules; bud scales single. *Flowers* appearing before or with the leaves in terminal and lateral cylindrical, imbricated catkins, the scales or bracts of which are entire and each subtending a flower, which is without calyx, and bears at its base 1 or 2 small nectiferous glands. *Sterile flowers* with 2 (but sometimes more) distinct or united stamens. *Fertile flowers:* ovary ovoid lanceolate, taper-pointed; style short; stigmas 2, short and mostly bifid. *Fruit* a 1-celled pod, dehiscent at maturity by two valves which roll back to the summit to liberate the numerous minute comose seeds.

Trees and shrubs with lithe round branches and growing mostly along streams and in moist localities. (*Salix* is from the Celtic, *sal, near* and, *lis, water*, alluding to the favorite locality of the willows.)

193. SALIX NUTTALLII, SARG.*

NUTTALL WILLOW.

Ger., *Weide von Nuttall;* Fr., *Saule de Nuttall;* Sp., *Sauce de Nuttall.*

SPECIFIC CHARACTERS: — *Leaves* involute in the bud, oblong-obovate, generally 1½–4 in. long, acute or abruptly acuminate or, particularly the lowermost, rounded at apex, wedge-shaped at base, entire or remotely and irregularly serrate or crenate-serrate, pilose and pale pubescent at first, but at maturity lustrous dark yellow-green above, pubescent along the broad midribs, pale and glabrous or puberulous to pilose beneath; petioles ¼ to ½ in. in length: stipules foliacious, semilunar, glandular-serrate, mostly caducous; branchlets pale pubescent at first, sometimes continuing until mid-summer or longer. *Flowers* appear in early spring, before the leaves, in oblong-cylindrical erect nearly sessile aments, on short tomentose branchlets bearing two or three silky white tomentose scale-like leaves. *Staminate* catkins about 1 in. long, pistillate catkins 1½ in. long and rather lax, but becoming 2–3 in. long at muturity; scales oblong, dark colored, coated with long silky white hairs and persistent in the fruit; stamens 2, with free glabrous filaments; ovary long-pointed, hoary pubescent, raised on a short stalk about one-third as long as the scale and crowned with the nearly sessile, broad, emarginate stigmas, the style obsolete. *Fruit* an ovate-lanceolate pale-pubescent capsule, about ¼ in. long.

Salix Nuttallii, var. *brachystachys*, Sarg., is the name given to the representatives of this species in the Pacific Coast region, from Alaska to Santa Barbara, which differ mainly from the typical form as above described in having shorter and more curved pistillate aments. The branchlets, etc., are often copiously clothed with silky pale tomentum the first season and it may persist during the second season.

The species is named in compliment to Thos. Nuttall who discovered and first described it as *S. flavascens*, a name not now considered tenable.

The Nuttall Willow is a small tree, and often only a shrub of but a few feet in height. Occasionally it attains the height of 50 or 60 ft. (17 m.) with erect or reclining trunk 2 ft. (0.60 m.) or less in diameter with contorted branches and drooping branchlets, and when growing in the open forming a rounded top. The bark of trunk is of a light gray color checked into irregular plate-like scales. When they flake off it is of a reddish brown color with flat fibrous ridges.

HABITAT. — The Nuttall Willow is distributed from southern British Columbia and Alberta southward along the banks of Rocky Mountain streams to New Mexico and Arizona, and along the Sierra Nevadas to the San Bernardino Mountains, where, at from 7,000 to 10,000 ft. altitude, Mr. S. B. Parish has found it as a shrub. It is represented in the coast region at much lower elevations, in its variety *brachystachys*, from the Alaskan boundary to the vicinity of Santa Barbara, Cal., and particularly abundant and well-developed in the swamps and bottom-lands about Puget Sound.

* *Salix flavescens, Nutt.*

PHYSICAL PROPERTIES. — The wood is light, tough, quite strong, close-grained, and of a light reddish-brown color, with light pinkish-white sap-wood, whitest near the bark. *Specific Gravity*, 0.4969; *Percentage of Ash*, 0.61; *Relative Approximate Fuel Value*, 0.4939; *Coefficient of Elasticity*, 108507; *Modulus of Rupture*, 808; *Resistance to Longitudinal Pressure*, 408; *Resistance to Indentation*, 98; *Weight of a Cubic Foot in Pounds*, 30.97. Of the variety *brachystachys*, the *Specific Gravity* is 0.5412; *Percentage of Ash*, 0.39; *Relative Approximate Fuel Value*, 0.5391; *Coefficient of Elasticity*, 126216; *Modulus of Rupture*, 909; *Resistance to Longitudinal Pressure*, 468; *Resistance to Indentation*, 126; *Weight of a Cubic foot in Pounds*, 33.73.

USES. — Little use is made of this timber.

GENUS POPULUS, TOURNEFORT.

Leaves broad, more or less heart-shaped or ovate, and with long and often vertically compressed petioles. *Flowers* appearing before the leaves in long, drooping, lateral, cylindrical catkins, the scales of which are furnished with a fringed margin; calyx represented by an oblique, cup-shaped disk with entire margin; stamens, 8–30 or more, with distinct filaments; pistil with very short, bifid style, and large 2-lobed stigma. *Fruit* as described for the order.

Genus represented mostly by rather large trees, and the name is a Latin word, meaning *people*, applicable either from the fact that these trees are often set along public walks, or in allusion to the tremulous motion of the leaves, which are in constant agitation like a crowd of people.

194. POPULUS FREMONTII, WATSON.

WHITE COTTONWOOD, FREMONT COTTONWOOD.

Ger., *Weisse Pappel;* Fr.. *Peuplier blanc;* Sp., *Alamo blanco.*

SPECIFIC CHARACTERS: — *Leaves* thick and firm, broadly deltoid or reniform narrowing to a short entire point, truncate, slightly cordate or abruptly wedge-shaped at the wide entire base, coarsely and irregularly crenate-serrate with few or a dozen or more incurved teeth on each side, coated as with the petiole with pale fungaceous pubescence at first but finally lustrous green, blade 2 to 3 in. long and about as wide; petioles 1 to 3 in. long, laterally compressed; branchlets terete, light green and pubescent at first, finally light yellowish gray. *Flowers* appear in February and March in aments with glabrous rachis and bracts; the staminate, 1½ to 3 in. long, densely flowered and with slender stems; scales thin, light brown, scarious, dilated and fimbriated at apex and caducous; stamens 60 or more with large dark red anthers inserted on a broad disk, 3–4 lines broad, with entire margin; pistillate aments with stouter and often puberulous stems, more sparsely flowered and 3-4 in. long; ovary ovoid or ovoid-oblong, glabrous, subtended by the cup-shaped, membranous persistent disk; stigmas 3, broad and irregularly crenate-lobed. *Fruit* ovoid capsules nearly ½ in. long, with thick slightly pitted walls, stout peduncle 1 line in length, on drooping racemes 4–5 in. long and dehiscent by 3 (rarely 4) valves; seeds nearly ⅛ in. in length, ovoid and copiously surrounded with long soft white cottony hairs.

The specific name is given in compliment to the botanical explorer, Capt. John C. Fremont.

A tree occasionally attaining the height of 100 ft. (30 m.), with rather open broad head of stout spreading branches and short trunk 5 or 6 ft. (1.50 m.) in diameter, having light gray bark, furrowed with firm rounded longitudinal and obliquely connecting ridges which finally exfoliate in small scales.

HABITAT. — The Fremont Cottonwood is found in California from the head waters of the Sacramento River southward and eastward through Nevada into Utah, marking the courses of streams and moist bottom-lands, and is especially abundant in central California, where it attains its largest size.

PHYSICAL PROPERTIES. — Wood soft, light, close-grained, not strong, of a light reddish-brown color with nearly white sap-wood. *Specific Gravity*, 0.4914; *Percentage of Ash*, 0.77; *Relative Approximate Fuel Value*, 0.4876; *Coefficient of Elasticity*, 105116; *Modulus of Rupture*, 698; *Resistance to Longitudinal Pressure*, 378; *Resistance to Indentation*, 86; *Weight of a Cubic Foot in Pounds*, 30.62.

USES. — The wood of this tree is extensively used for fuel, it being the chief source of supply in some localities and by pollarding the trees a crop of branches may be gathered for that use every four or five years. The tree is extensively planted along street-sides, etc., for shade and ornamental purposes. The inner bark was formerly used, it is said, by Indians of the southwest for making petticoats.

MEDICINAL PROPERTIES, though not specifically mentioned of this tree, are doubtless the same as those mentioned of the *Populus monilifera*, Part II., p. 39.

GYMNOSPERMÆ.

Flowering, exogenous plants with *leaves* chiefly parallel-veined and cotyledons frequently more than two. *Flowers* diclinous and very incomplete ; pistil represented by an open scale or leaf, or altogether wanting, with ovules naked, fertilized by direct contact with the pollen, and seeds at maturity naked — without a true pericarp.

ORDER CONIFERÆ : PINE FAMILY.

Leaves mostly awl-shaped or needle-shaped, evergreen, entire and parallel-veined. *Flowers* monœcious, or rarely dicœcious, in catkins or cones, destitute of both calyx and corolla ; stamens one or several (usually united) ; ovary, style and stigma wanting ; ovules one or several at the base of a scale, which serves as a carpel, or on an open disk *Fruit* a cone, woody and with distinct scales, or somewhat berry-like, and with fleshy coherent scales, seeds orthotropous, embryo in the axis of the albumen.

Trees or shrubs with a resinous juice.

GENUS CUPRESSUS, TOURNEFORT.

Leaves persistent, small, scale-like, decussately opposite, thick, rounded or keeled, adnate to and decurrent upon the stem, usually glandular-pitted on the back, appressed or slightly spreading at the pointed or rounded apex, margin

entire or denticulate; leaves on vigorous young shoots commonly awl-shaped or linear-lanceolate and spreading; branchlets not forming flat sprays. — *Flowers* appear in early spring, monœcious, in small catkins terminating the leafy branchlets; the staminate aments oblong or cylindrical, consisting of a few pairs of decussately opposite, yellowish ovate or orbicular subpeltate scales attached to the under sides of each of which are two to six subglobose pendulous anther-cells opening by a longitudinal slit; pollen-grains simple. The pistillate flowers terminate short branchlets, subglobose, scales thick, ovate acute and bearing attached to their bases on the inner surface generally numerous, erect, orthotropous bottle-shaped ovules. *Fruit* a subglobose, short-stalked, rugose woody cone, generally maturing the second year, scales closely valvate peltate, polygonal in outline at apex, flattened and bearing more or less prominent central bosses, at maturity opening along their margins and persisting after liberating their numerous irregularly compressed acutely angled thick-coated seeds, which are borne in several rows on the base of the scale; embryo erect in fleshy albumen, cotyledons usually two.

Genus consists of resinous trees with generally fragrant wood of considerable economic value, especially in Japan. About a half dozen species are found in the United States along the Pacific slope.

(*Cupressus* is the classical Latin name of the Cypress tree.)

195. CUPRESSUS MACROCARPA, GORD.

MONTEREY CYPRESS.

Ger., *Cypresse von Monterey;* Fr., *Cypres de Monterey;* Sp., *Ciprés de Monterey.*

SPECIFIC CHARACTERS: — *Leaves* broad ovate, about $\frac{1}{8}$ in. long, dark green, acute, closely appressed or slightly spreading at apex, thick and obscurely glandular-pitted on the back and often with a longitudinal furrow on each side. Those on young plants spreading and acicular; branchlets short and covered with reddish-brown bark with papery scales. *Flowers* (February and March) yellow; the staminate small, about $\frac{1}{8}$ in. long, oblong, quadrangular, with 6-8 decussately opposite stamens with broad peltate connectives slightly erose on margins and each bearing 4-5 orange-colored pollen sacs: pistillate flowers oblong, terminal, about $\frac{1}{8}$ in. long and with spreading acute scales. *Fruit* subglobose or oblong clustered cones, maturing the second season, from 1-1$\frac{1}{2}$ in. long, puberulous, with short peduncle about $\frac{1}{4}$ in. in length, with four or six pairs of peltate scales having elevated or sub-conical central bosses; the upper and lower pairs of scales smaller than the others and sterile, and beneath each of the other scales are produced about twenty light brown angular seeds about $\frac{3}{16}$ in. long.

(The specific name is the Greek for *large fruit.*)

This exceedingly interesting tree is found only in or near its famous home on the bluffs of Cypress Point, which projects out into the Pacific near Monterey, California. They are there trees of very striking aspect, with sturdy contorted trunks, sometimes 5 or 6 ft. (1.80 m.) in diameter, and huge gnarled branches supporting a dense flat top, almost like a platform composed of the flat sprays of the topmost branches, 50 or 60 ft. (18 m.) above ground, and with little or no other foliage. This arrangement offers the least resistance to the ever-prevailing winds from the ocean and the greatest amount of surface to the sun. Sheltered by these giant vanguards the trees grad-

ually present fuller and more open tops and far less sturdy trunks as we go back away from the coast into the adjoining forest. Here in young trees we find the habit of growth is distinctly pyramidal.

The bark of trunk is of a purple-brown color, in exposed situations bleaching out to almost whiteness, rough with longitudinal and obliquely connecting ridges which exfoliate in long scales and fibrous strips.

HABITAT. — Though doubtless a tree of much wider distribution in earlier times its natural range is now the most restricted of the American Coniferæ, being found only in Monterey Co., California, at Cypress Point and southward to the shores of Carmel Bay and across the bay at Point Lobos, in all a distance of scarcely five miles. It extends inland only a few rods from the great breakers of the coast, and there mingles with the Monterey Pine which gradually replaces it altogether. One of the most interesting spots on the American continent for the lover of trees is this Cypress Point, where he may see the famous monarchs above described scattered singly or in groups with interlocked branches on a rolling glade like one vast lawn frequently bedewed with moisture from the ocean. They seem to rejoice in their ceaseless battle with the winds from the Pacific and approach so closely to it as to be frequently bathed with its spray. One thinks it strange that a tree loving this bleak spot so well can adapt itself to almost any soil or climate not too cold from Vancouver's Island to Lower California, for it is the most extensively planted and the most rapid grower of the coniferous trees throughout all this region.

PHYSICAL PROPERTIES. — The wood is moderately heavy, hard and strong, close-grained, easily worked, slightly fragrant and susceptible of a very smooth polish. It is of a light-brown color streaked with yellow and light purple; sap-wood buff-white. *Specific Gravity*, 0.6261; *Percentage of Ash*, 0.57; *Relative Approximate Fuel Value*, 0.6225; *Coefficient of Elasticity*, 107327; *Modulus of Rupture*, 1045; *Resistance to Indentation*, 237; *Weight of a Cubic Foot in Pounds*, 39.02.

USES. — The most extensively planted coniferous tree in the Pacific States for ornamental purpose, wind-breaks, and hedges, growing with wonderful vigor and enduring annual trimming to a remarkable extent. It is planted sometimes in our southeastern states, in South America, Australia, and extensively in southern and western Europe.

NOTE. — Visitors to the home of the Monterey Cypress are often told by the people residing thereabouts that " this tree is only found

here and in the Holy Land." This is an error. The tree in the Holy Land to which reference is made in this statement is the Cedar of Lebanon (*Cedrus Libani*), very different, of course, from the Cypress botanically, though its habit of growth is so similar to that of the flat-topped Cypress trees of Cypress Point that it has given rise to the popular belief, among people not particularly versed in trees, that they are the same.

GENUS PINUS, TOURNEFORT.

Leaves evergreen, needle-shaped, from slender buds, in clusters of 2–5 together, each cluster invested at its base with a sheath of thin, membranous scales. *Flowers* appearing in spring, monœcious. *Sterile flowers* in catkins, clustered at the base of the shoots of the season; stamens numerous with very short filaments and a scale-like connective; anther cells, 2, opening lengthwise; pollen grains triple. *Fertile flowers* in conical or cylindrical spikes — cones — consisting of imbricated, carpellary scales, each in the axil of a persistent bract and bearing at its base within a pair of inverted ovules. *Fruit* maturing in the autumn of the second year, a cone formed of the imbricated carpellary scales, which are woody, often thickened or awned at the apex, persistent, when ripe, dry and spreading to liberate the two nut-like and usually winged seeds; cotyledons 3-12, linear.

(*Pinus* is a Latin word from Celtic *pin* or *pen, a crag.*)

196. PINUS MONOPHYLLA, TORR.

SINGLE-LEAF PIÑON PINE, NUT PINE, PIÑON.

Ger., *Einzigblättrige Fichte;* Fr., *Pin monofeuillier;* Sp., *Pino de sola hoja.*

SPECIFIC CHARACTERS: — *Leaves* solitary, terete, from 1 to 2½ in. long (occasionally in 2-leaved fascicles and semi-terete) stout, rigid, incurved and spine-like, with sharp callous tips, pale glaucous-green, with 18 to 26 rows of stomata, 2 to several resin ducts and a single central fibro-vascular bundle, sheathes with short and reflexed scales which soon fall away leaving thin persistent bases. *Staminate flowers* oval, about ¼ in. long, dark red, usually surrounded by 6 involucral bracts; anthers terminating in minute knobs or teeth. *Pistillate flowers* oval, lateral, with thick apiculate scales and raised on short thick peduncles which are surrounded by about half a dozen involucral bracts. *Fruit* stout, ovoid, bright green cones, 1½ to 2½ in. long and of nearly the same thickness with few scales (the central ones only bearing fertile seeds), rounded at apex, ¾ in. across or less, the thick exposed portion being four-angled and bearing a prominent truncate or concave umbo. After maturity the cones open widely and are of a lustrous light yellowish brown color; seeds edible, falling away from the light brown wings which remain attached to the scales, compressed, dark reddish brown oblong, about ¾ in. or less in length, pointed at apex, rounded at base, mottled yellowish brown, spotted with purple, with thin brittle shell, oily albumen and embryo with 7–10 cotyledons.

(The specific name is from the Greek μόνος, *solitary*, and φύλλον, *leaf.*)

A small tree, with low rounded or irregularly wide pyramidal top, with long crooked lower branches, almost resting on the ground. I have seen it some over 30 ft. (9 m.) in height, but generally it is considerably less, with short trunk, rarely over 18 in. (0.45 m.) in diameter, covered with a rather thin light-brown bark, with broad

irregular plate-like ridges which flake off in brittle rounded scales. The distinctly gray or light bluish-green full foliage of the tree gives it a conspicuous and characteristic aspect.

HABITAT. — From the Wasatch Mountains in Utah, westward to the eastern slopes of the Sierra Nevada Mountains, and in localities on the western slopes of the southern Sierra Nevadas, the San Raphael and San Bernardino Mountains, and southward into Lower California and in Arizona on arid slopes and mesas, from 3,000 to 7,000 ft. altitude. It is especially abundant in Nevada and along the eastern slopes of the Sierra Nevada Mountains.

PHYSICAL PROPERTIES.—Wood light, soft, not strong, close-grained, of slow growth and with yellowish brown heart-wood and lighter sap-wood. *Specific Gravity*, 0.5658; *Percentage of Ash*, 0.68; *Relative Approximate Fuel Value*, 0.5620; *Coefficient Elasticity*, 43488; *Modulus of Rupture*, 288; *Resistance to Longitudinal Pressure*, 274; *Resistance to Indentation*, 169; *Weight of a Cubic Foot in Pounds*, 35.26.

USES. — The wood is extensively used for fuel and charcoal, for which latter use it is employed more extensively in the Great Basin than any other timber.

The seeds of this tree form a very important article of food with the Piute, Shoshone and Penamint Indians and other tribes of the regions in which it grows. They gather the cones in great quantities and roast them sufficiently to make them open and liberate the nuts, which are then eaten raw, roasted or pounded into a flour with which they make a sort of bread.

197. PINUS TORREYANA, PARRY.

TORREY PINE, DEL MAR PINE, SOLEDAD PINE.

Ger., *Fichte von Torrey;* Fr., *Pin de Torrey;* Sp., *Pino de Torrey.*

SPECIFIC CHARACTERS: — *Leaves* in clusters of five each, from the axils of lanceolate fringed bracts, stout, 8 to 13 in. long, sharply and minutely serrulate, with acute callous tips and growing in large tufts at the ends of the branchlets, with sheathes at first an inch or two long, with loose fringed scales, but finally become reduced to ½ or ¾ in. in length. The leaves contain two fibro-vascular bundles, generally three resin ducts and several rows of stomata on each face; branchlets thick and rough with the thick persistent bases of the bracts. *Flowers* appear from January to March, the staminate cylindrical, 2½ in. in length, with involucral bracts at base and in short dense heads; anthers yellow with denticulate crests; the pistillate flowers oblong-ovoid, about ¾ in. long, in subterminal pairs, with stout peduncles about 1 in. in length covered with chestnut-brown scarious bracts. *Fruit* broad-ovoid cones, 4-6 in. long, with stout peduncles generally somewhat deflexed, of a chocolate brown color, with scales about 1 in. broad, with short point at apex very thick and furnished with wide-

based short or elongated spine-tipped umbos; cones generally breaking away from the tree through their bases two or three years after maturity, so that a few of the undeveloped scales are left on the peduncles attached to the branch; seeds subovoid, about $\frac{3}{4}$ in. long, yellowish brown with hard shell nearly $\frac{1}{16}$ in. thick, short thick dark-brown wing extending about $\frac{1}{2}$ in. beyond the apex and rich delicious kernel.

(The specific name, *Torreyana*, is in compliment to the botanist, Dr. John Torrey.

This interesting tree, as usually seen on the bluff coast, is a very low tree with wide-reaching branches, but in sheltered cañons it attains the height of 40 or 50 ft. (14 m.), with foliage conspicuously arranged in large tufts at the extremities of the branchlets. The bark of the trunk is of a rich brown color, rough with thick scaly ridges which flake off in irregular scales.

HABITAT. — The Torrey Pine, the most limited in distribution of all our Pines, is found close along the Pacific coast of California, from a point within the extended city limits of San Diego northward about eight miles to the San Dieguito River, and inland about a mile and a half. Isolated from this locality by a distance of one hundred and seventy-five miles to the northwestward, on the bluffs of the eastern end of the island Santa Rosa, is found another grove, the only one known outside the range as above defined.

PHYSICAL PROPERTIES. — Wood light, soft, not strong, coarse-grained, and of a light reddish brown color, with thick yellowish-white sap-wood. *Specific Gravity*, 0.4879; *Percentage of Ash*, 0.35; *Relative Approximate Fuel Value*, 0.4862; *Coefficient of Elasticity*, 54213; *Modulus of Rupture*, 756; *Resistance to Longitudinal Pressure*, 290; *Resistance to Indentation*, 147; *Weight of a Cubic Foot in Pounds*, 30.41.

USES. — The wood of this tree has been used for fuel, and its large seeds, which are rich and delicious in flavor, are often gathered and eaten raw or roasted.

NOTE. — The inroads upon this tree for fuel by irresponsible people residing near it has been so great that its extermination has been greatly feared, but fortunately the city of San Diego has recently passed an ordinance prohibiting the cutting of any of the trees within the city limits under penalty of a heavy fine. As most of the existing trees are in the city limits, as now extended, it is reasonable to expect that the species will be perpetuated at least for a long time to come in its native home.

198. PINUS SABINIANA, DOUGL.

GRAY-LEAF PINE, DIGGER PINE, SABINE PINE.

Ger., *Graublättrige Fichte;* Fr., *Pin de feuilles gris;* Sp., *Pino de hojas gris.*

SPECIFIC CHARACTERS: — *Leaves* in clusters of three each, 8–12 in. long, of a pale blue-green color, with slender long callous tips, sharply serrulate, flexible, pendent after the first season and furnished with many rows of stomata on each face, with one to three parenchymatous resin ducts, sheathes at first about 1 in. long, but finally not more than about half that; branchlets large, pale glaucous and distinctly marked with depressed lines giving the appearance of fish scales. *Staminate flowers* oblong cylindrical, about an inch in length, surrounded at base by 10 to 15 involucral bracts, the outermost minute; anthers yellow, bearing semi-orbicular crests. *Pistillate flowers* are oblong-obovate about ½ in. long, with purple glaucous scales borne on spreading peduncles from 1½–2 in. long and covered with ovate acute bracts. *Cones* oblong-ovoid from 4 to 8 in. long, nearly as wide and weighing from 2 to 5 lbs., reddish brown, with scales about an inch wide and rounded at apex, the exposed portion conspicuously keeled transversely and bearing each a prominent flattened thick spine, which above the middle of the cone is erect or incurved, below the middle, reflexed; seeds large, about ¾ in. long, oblong, somewhat compressed, with thick hard shell ridged laterally and inclosed each by the thickened margin of its wing, which is broad and rounded at apex and about one-third of an inch longer than the seed; kernel oily and of slightly resinous flavor.

(The specific name, *Sabiniana*, was given to this tree after Joseph Sabine an English botanist)

The Gray-leaf Pine occasionally attains the height of 80 ft. (24 m.), with a trunk 3 or 4 ft. (1 m.) thick. The bark of trunk is of a reddish brown color and with very prominent ridges which exfoliate in irregular brittle scales.

It is remarkable as a Pine in that instead of forming a single undivided trunk its trunk usually divides 15 or 20 ft. from the ground into two or more secondary trunks, which in turn send out branches, and all form a large, rather irregular top, with very open airy foliage. Its slender drooping gray-green leaves, with conspicuous cones, are clustered mainly near the extremities of the branchlets, and offer very little resistance to the sun's rays; consequently, it casts a very meagre shade. The whole aspect of the tree is very different from that of all other Pines with which I am familiar. Prof. J. G. Lemmon aptly likens the appearance of groves of these trees as observed from a distance to "masses of fog on the plains or bands of clouds in the mountain cañons of California."

HABITAT. — California — the sunbeaten western foothills of the Sierra Nevadas and Coast ranges from near the northern boundary of the state southward to the Sierra Libre Mountains, and ranging from 500 to 4,000 ft. in altitudinal distribution.

PHYSICAL PROPERTIES. — Wood soft, light, brittle, not strong, of rapid growth, with yellowish brown heart-wood and abundant pale yellow sap-wood. *Specific Gravity*, 0.4840; *Percentage of Ash*, 0.40; *Relative Approximate Fuel Value*, 0.4821; *Coefficient of Elasticity*, 58517; *Modulus of Rupture*, 779; *Resistance to Longitudinal Pressure*, 337; *Resistance to Indentation*, 138; *Weight of a Cubic Foot in Pounds*, 30.16.

USES. — Wood very inferior for lumber and fuel; hence but little used. The delicious edible nuts in early days were an important article of food with the Indians of California, known as Digger Indians, and from that fact it derived its common vernacular name, Digger Pine.

MEDICINAL PROPERTIES. — A volatile oil is distilled from the resinous exudation of this tree and is extensively used in California under the name of *abietene* and other less appropriate designations (as *evasine*, *aurantine* and *theoline*). It is a nearly colorless liquid, with the odor of oil of Oranges, and is believed to possess powerful anæsthetic properties. Its value in medicine has probably been overestimated, though it is extensively employed for removing grease spots and stains from clothing, and to some extent as an insecticide.*

199. PINUS RADIATA, DON †

MONTEREY PINE.

Ger., *Fichte von Monterey;* Fr., *Pin de Monterey;* Sp., *Pino de Monterey.*

SPECIFIC CHARACTERS: — *Leaves* from 4–6 in. long, in clusters of three each; sheathes at first loose, scarious and from ½ to ¾ in. long, but finally firmer, darker colored and only ¼ in. long, leaves serrulate, stonatiferous on three faces, with two fibro-vascular bundles and usually a single parenchymatous resin duct. *Staminate flowers* in dense cylindrical oblong spikes 1 to 1½ in. long, with ten involucral bracts and yellow anthers terminating in orbicular denticulate crests. *Pistillate flowers* lateral, generally several together in a whorl on short stout bract-covered peduncles, dark purple, with ovate slender-tipped scales and conspicuous orbicular bracts. At the end of the first year the young cones are nearly horizontal, ovoid, about 1 in. or less long and with minute incurved spines. *Cones* when mature are 3 to 5 in. long, lustrous chestnut brown, short-stalked, very oblique-ovoid, pointed at apex, deflexed, with scales rounded at the apex, purple beneath, the exposed portion of the scales on the outer side toward the base very thick gibbous, elsewhere quite flat, each with an obscure transverse ridge and small purplish umbo tipped with a minute deciduous prickle; seeds about ¼ in. long, with black compressed purple-brown tuberculate testa and thin light-brown wing, about 1 in. in length, longitudinally striated; cotyledons 5 to 7.

* *U. S. Dispensatory*, 17th ed., pp. 972 and 1354; also Sargent's *Silva* XI, p. 96.

† *Pinus insignis*, Dougl.

A variety known as Var. *binata*, Lemmon, growing on the Islands of Santa Rosa, Santa Cruz and Guadaloupe, is quite shrubby in habit of growth, has leaves mostly in pairs, and small cones about 3 in. long with scales nearly devoid of tubercles.

(The specific name, *radiata*, *radiated*, is suggested by the arrangement of the cones, which are commonly in whorls about the branches and hence radiate in different directions.)

This handsome Pine occasionally attains the height of 100 ft. (30 m.), with a trunk 3 or 4 ft. (1 m.) or more in diameter, having a rather thick bark of a dark purple-brown color on the surface and deeply divided into broad ridges which exfoliate in irregular plate-like scales. It forms a handsome round-pyramidal head of bright green dense foliage in sheltered localities, but on the bluffs of the coast it is very much distorted by the winds. There a tree with trunk 2 ft. or more in thickness may not attain a height of more than 20 feet, but reaches far off horizontally to leeward.

HABITAT. — A tree of very limited distribution the Monterey Pine is found along the Pacific Coast of California from Pescadero to San Simeon Bay, with headquarters, we might say, at Point Pinos, just south of Monterey Bay, where it forms a small tract of forest and attains its largest size. It extends but a few miles inland. It is found in a more scrubby and somewhat altered form (var. *binata*) on the islands of Santa Rosa, Santa Cruz and Guadaloupe.

PHYSICAL PROPERTIES. — Wood light, soft, not strong, brittle and usually of very rapid growth. It is of a pale purple-brown color, with abundant yellowish-white sap-wood. *Specific Gravity*, 0.4574; *Percentage of Ash*, 0.30; *Relative Approximate Fuel Value*, 0.4560; *Coefficient of Elasticity*, 97850; *Modulus of Rupture*, 740; *Resistance to Longitudinal Pressure*, 417; *Resistance to Indentation*, 105; *Weight of a Cubic Foot in Pounds*, 28.51.

USES. — Formerly the Monterey Pine was used for lumber, but now it is only used to a limited extent for fuel. The tree is very extensively planted for ornamental purposes and wind-breaks, for which it is admirably suited, owing to its rapidity of growth and adaptability to conditions of soil and climate. In this respect it resembles the Monterey Cypress, which, strangely, hails from the same locality, and is its only peer in popularity for this use along the Pacific Coast from the boundary of the British possessions to southern California. It is also successfully planted in the southeastern states, Mexico, Australia and New Zealand, and has long been popular in western and southern Europe.

ENDOGENOUS OR MONOCOTYLEDONOUS PLANTS.

Flowering plants, in the stems of which the woody fibers and vessels are irregularly imbedded in bundles in cellular tissue (not in annual layers). The leaves are mostly parallel-veined, sheathing at the base, alternate or scattered, not toothed and rarely separating by an articulation. First leaf of the embryo (cotyledon) single and the parts of the flower generally in threes.

PALMÆ: PALM FAMILY.

Leaves flabellate or pinnately divided, rarely simple, springing from the terminal bud, alternate and with base sheathing the stem. *Flowers* usually diclinous, on a branched spadix; perianth of six herbaceous segments in two rows; stamens six (rarely fewer or more) hypogynous or perigynous; pistil with superior 3- (rarely 1-) celled ovary of three separate carpels with a single or rarely 2 ovules in each cell; styles short, free or connate. *Fruit* commonly a berry or drupe, with large seeds having a minute peripheric embryo in fleshy or horny albumen.

The order consists of upwards of 1,000 species of perennials — trees and shrubs — of tropical and subtropical regions, of elegant or majestic habit of growth and many of them of great economic importance. Their stems present the typical endogenous structure, the wood forming in dense wire-like bundles, known as fibro-vascular bundles, between which is a mass of thin walled pith like cells known as parenchyma. The woody bundles are crowded more closely together toward the periphery of the stems, which is generally there quite hard in consequence and the central portion is comparatively soft. There is no true bark on these stems nor is there a central pith column as with exogenous stems.

GENUS WASHINGTONIA, WENDLAND.

Leaves flabellate, orbicular, plicate in vernation, deeply divided into many 2-cleft segments, from the margins of which hang numerous pale thread-like fibres, and at the union of the petiole with the blade above is a thin elongated laciniate ligula; petioles long, broad, with margins armed with strong, variously hooked and straight wide-based but thin spines, the base of petiole widening out and margined with a broad fabric-like chestnut-brown network of strong fibres. *Flowers* perfect, small, white, from the axils of ovate acute scarious bracts, on elongated paniculate glabrous spadices, which appears from among the leaves with numerous flexuose pendulous branches; spathes numerous, narrow, elongated, glabrous; calyx tubular, scarious, with three small eroded lobes, indurate at base, persistent, imbricated in æstivation; corolla funnel-shaped with fleshy tube half as long as the three lanceolate acute striate reflexed lobes, imbricated in æstivation, deciduous; stamens usually six, sometime three or many, exserted, with free filaments thickened below the middle, slender at apex and bearing linear-oblong 2-celled versatile pale yellow anthers, attached on the back and longitudinally dehiscent; ovary superior, sessile, 3-lobed, 3-celled, with elongated flexuose exserted style, stigmatic at apex and containing a single lateral erect anatropous ovule in each cell. *Fruit* drupaceous, small, blackish, globose-elliptical, short stalked and crowned with the remnants of the style and abortive carpels, the fleshy pericarp thin and sweet, and the seed oblong-ovoid, with minute sublateral hilum, conspicuous raphe, thin brown testa, horny albumen and minute lateral embryo.

Genus composed of two species; one, found in California and the adjacent regions of Lower California, is described below, and the other, *Washingtonia Sonorae*, is found in the mountain cañons of western Sonora and southern Lower California and as yet is quite imperfectly known.

200. WASHINGTONIA FILAMENTOSA, O. K.

CALIFORNIA FAN PALM, DESERT PALM.

Ger., *Californische Wedelpalme;* Fr., *Palmier d'eventail;* Sp., *Palma de abanico.*

SPECIFIC CHARACTERS: — *Leaves* light green, 5 to 6 ft. in length and nearly as broad, with stout elongated petioles 4–6 feet long and about 2 in. broad at the upper end, 5 or 6 in. at base, where they split and widen into the sheathing base, and strongly armed along the margins with variously curved and straight thin broad-based spines; ligulas 4–6 in. long irregularly laciniate. *Flowers* (May to June) slightly fragrant in glabrous light-green paniculate spadices, 10 to 12 feet long, from the axils of upper leaves, at first erect and spreading, but finally pendulous. *Fruit* (ripe in September) very abundant black drupes, about ½ in. long with thin sweet pulp; seed ¼ in. long.

The specific name, *filamentosa*, is from the Latin *filum*, *thread*, referring to the thread-like fibres hanging from the edges of the leaves.

This beautiful Palm, the largest of the family growing within the United States, sometimes attains the height of 75 ft. (22 m.), with a trunk 3 ft. (1 m.) or somewhat more in diameter at base. It is crowned with a tuft of great fan-shaped light green leaves, which, springing vertically from the growing summit, gradually bend outward, and when finally brown and lifeless lop down about the trunk where a great mass of them accumulates and persists for some years until they gradually drop away and leave the naked brown columnar trunk rough with the projecting wire-like bundles of wood. This is the appearance of the tree unkempt, in its desert home, but with ornamental trees the old leaves are usually trimmed off as soon as they become unsightly and droop. The trunk is then left, either wickered over, as it were, with the forked bases of the old leaves or those too are trimmed away and an annulated rind-like covering remains.

HABITAT. — Along the borders of the depression in the Colorado Desert, which was once filled by an inland sea, extending up some of the cañons of the neighboring San Jacinto and San Bernardino Mountains and ranging southward into Lower California, growing in moist and usually alkaline soil near the beds of canons and water courses where it forms in places small open groves.

PHYSICAL PROPERTIES. — The wood of this Palm is light and soft, with rather large fibro-vascular bundles of a garnet color in old trunks, and sparsely distributed through the mass of pinkish colored pith-like intervening tissue (parenchyma), each bundle with two or three large ducts near the periphery. The color above alluded to is what I have seen in old wood taken from near the base of the trunks

whose exterior was charred by repeated burnings of the accumulated dead leaves about their crowns by the Indians, and I am inclined to think that the tissues of the trunk were colored in consequence. In new wood the parenchyma is nearly white, and the bundles of a light greenish yellow color.

The wood shrinks very greatly in drying, the area covered by one of our transverse sections being now only about half what it was when the tree was freshly cut. As the shrinkage is mainly in the parenchymatous tissue the bundles of wood must not be considered as being as close together in the growing tree as shown in the accompanying section.

USES. — The fruit of this tree has long been an article of food by the Indians, who eat it fresh and also grind the seeds into a flour. They have a habit of setting fire to the dead leaves which accumulate about the crown of the tree and which they are said to do for a double purpose — offering incense to the souls of their departed ancestors and hastening the ripening of the fruit, which I am told they can do by about a month.

The Washington Palm is justly very popular for ornamental planting, and so extensively has it been planted along the streets and about the orange orchards of southern California that it has become a feature already prominent in the aspect of the region, and in time will give it the appearance in places, it would seem, almost of palm forests.

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176. RHAMNUS INSULARIS, Greene.

Island Buckthorn, Island Bearwood.

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RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Eiländischer Kreuzdorn. *Fr.* Nerprun insulaire.

Sp. Ramno de isla.

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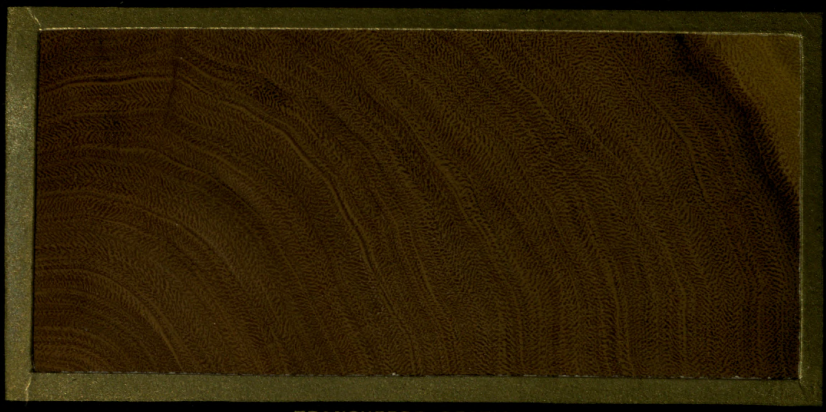
176. RHAMNUS INSULARIS, Greene.

Island Buckthorn, Island Bearwood.



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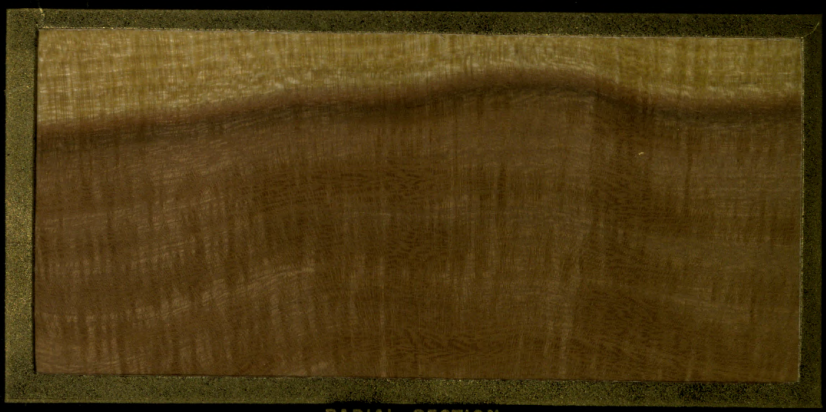

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Sp. Ramno de isla.

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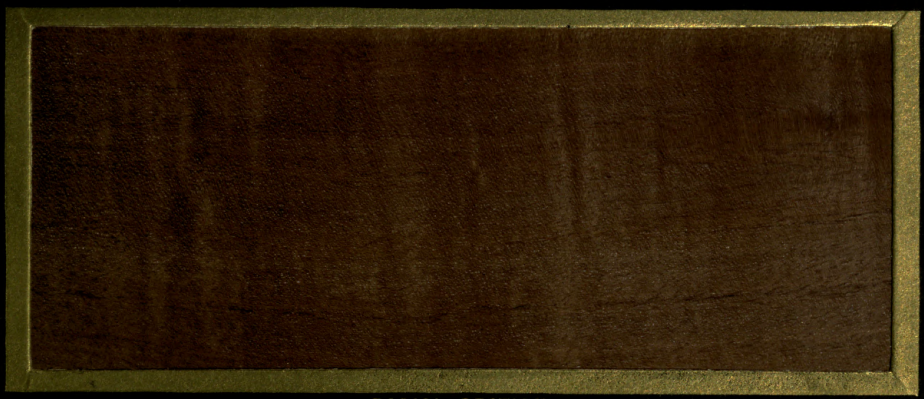
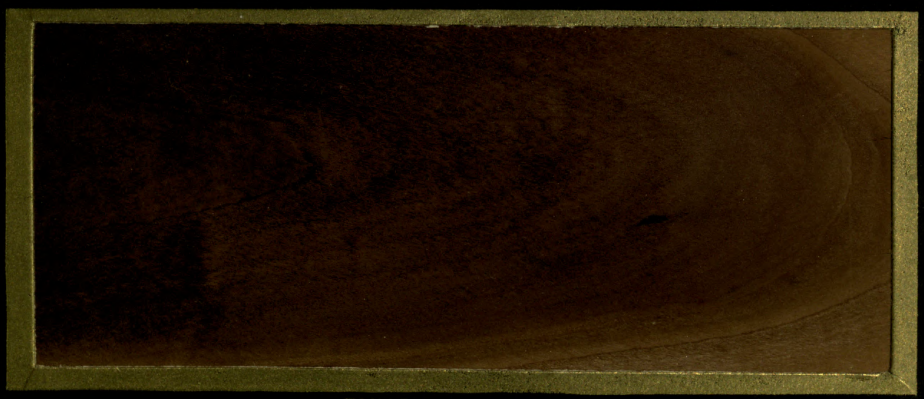
177. CEANOTHUS ARBOREUS, Greene.

Tree Myrtle.

TRANSVERSE SECTION.



RADIAL SECTION.



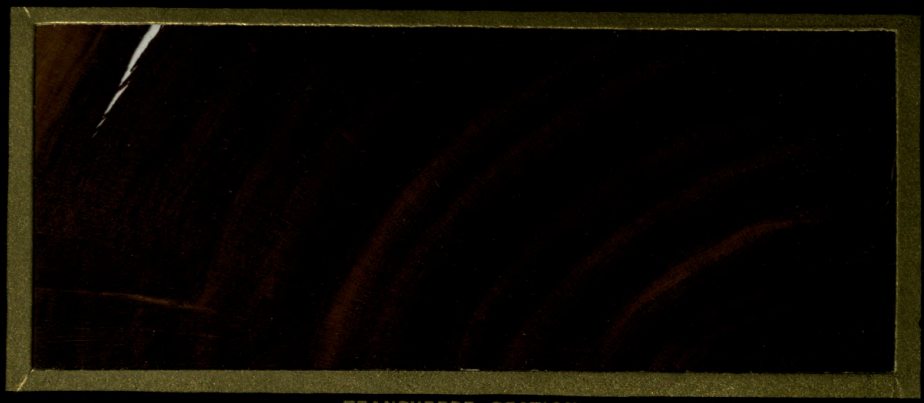
TANGENTIAL SECTION.

Ger. Baumische Myrte. *Fr.* Myrte d'arbre.

Sp. Mirto de arbol.

177. CEANOTHUS ARBOREUS, Greene.

Tree Myrtle.



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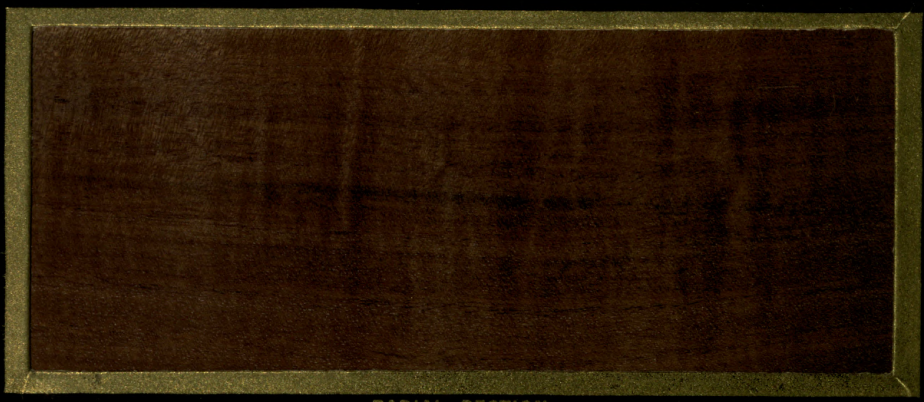

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Sp. Mirto de arbol.

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178. SCHINUS MOLLE, L.

Pepper-tree, Chili Pepper, False Pepper.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Pfefferbaum. *Fr.* Poivrier faux. *Sp.* Pimiento falso.

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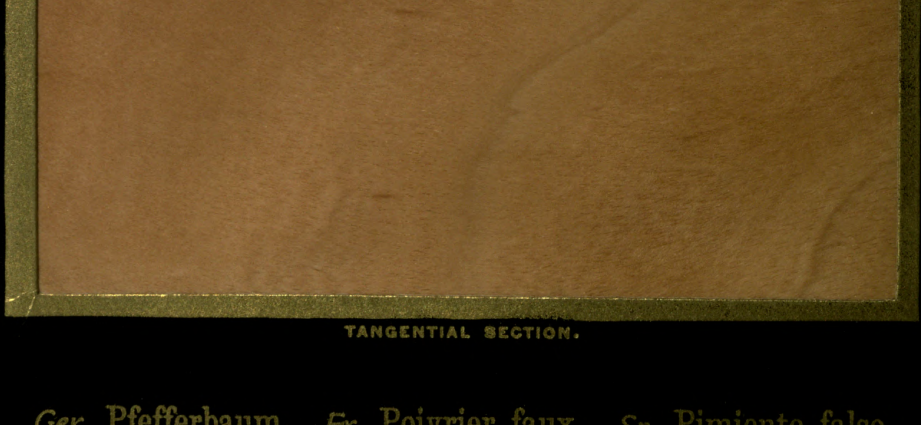
178. SCHINUS MOLLE, L.

Pepper-tree, Chili Pepper, False Pepper.

TRANSVERSE SECTION.

RADIAL SECTION.



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179. RHUS INTEGRIFOLIA, B. & H.

Sour-berry, Sour-wood, Sour Oak, Mahogany.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Sauerbeere. *Fr.* Baie aigre. *Sp.* Baya agria.

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179. RHUS INTEGRIFOLIA, B. & H.

Sour-berry, Sour-wood, Sour Oak, Mahogany.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

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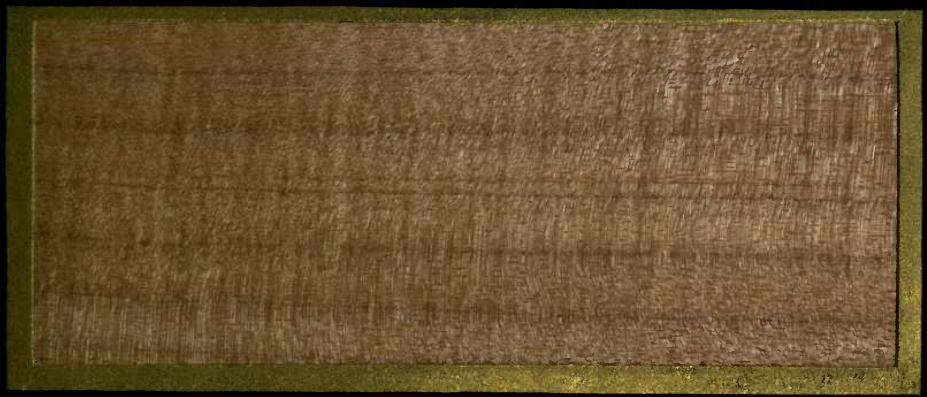
180. RHUS LAURINA, Nutt.

Laurel Sumach, Sumach.

TRANSVERSE SECTION.



RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Lorberblättriger Sumach. *Fr.* Sumac de laurier.

Sp. Zumaque de laurel.

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180. RHUS LAURINA, Nutt.

Laurel Sumach, Sumach.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Lorberblättriger Sumach. *Fr.* Sumac de laurier.

Sp. Zumaque de laurel.

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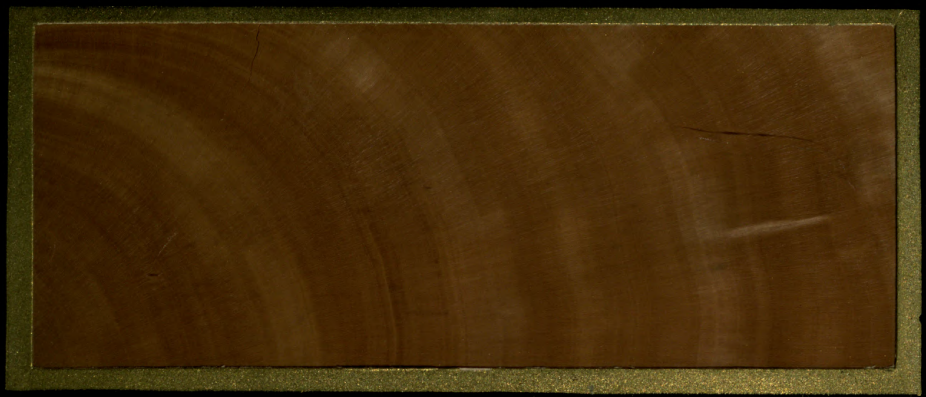
151. HETEROMELES ARBUTIFOLIA, Roem.

Christmas-berry, California Holly, Toyon, Tollon.



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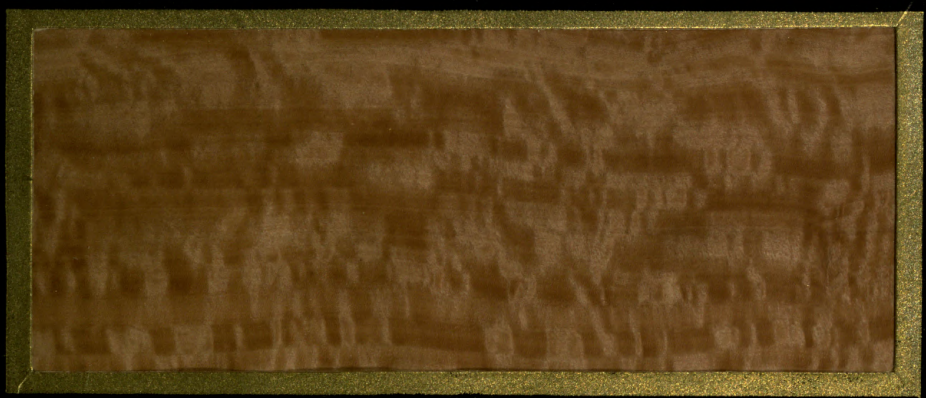

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TANGENTIAL SECTION.

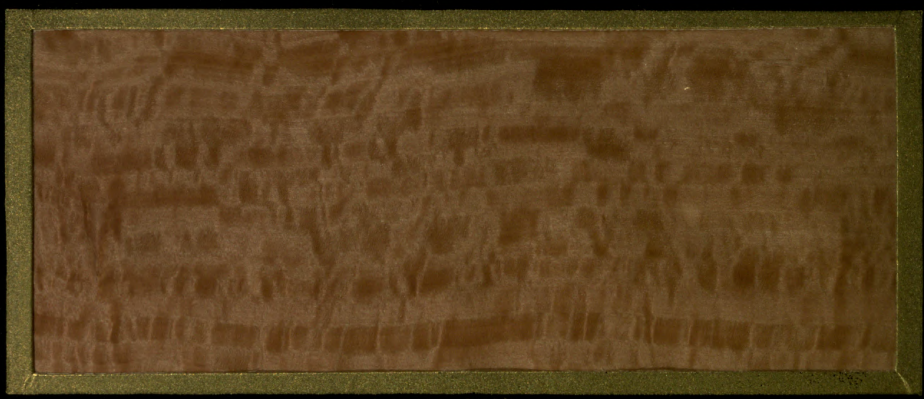
Ger. Christfestbeere. *Fr.* Houx de Californie. *Sp.* Tollon.

Published and Specimens made by Bernard R. Harris, B. A., Louisville, Ky., U. S. A.

181. HETEROMELES ARBUTIFOLIA, Roem.

Christmas-berry, California Holly, Toyon, Tollon.

TRANSVERSE SECTION.



RADIAL SECTION.

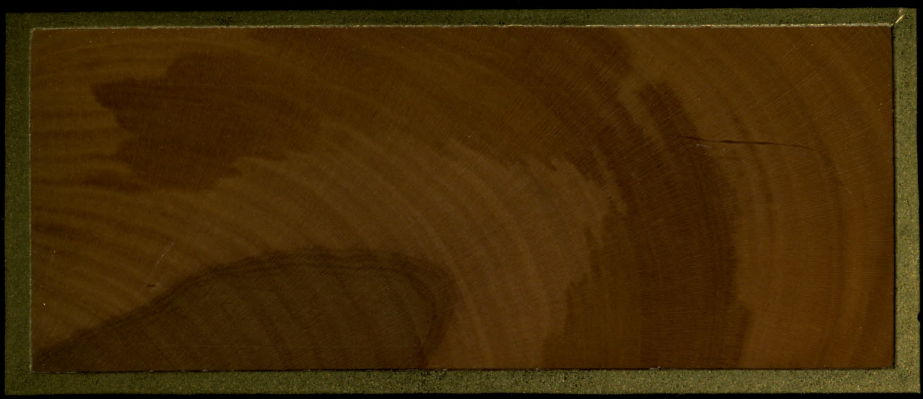
TANGENTIAL SECTION.

Ger. Christfestbeere. *Fr.* Houx de Californie. *Sp.* Tollon.

Published and Sections made by Romeyn B. Hough, C. A., Lowville, N. Y., U. S. A.

182. LYONOTHAMNUS FLORIBUNDUS, Gr.

Santa Catalina Iron-wood, Santa Cruz Iron-wood.



TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Eisenholtz von St. Catalina. *Fr.* Bois dur de St. Catalina.

Sp. Arbol de Hierro de Santa Catalina.

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182. LYONOTHAMNUS FLORIBUNDUS, Gr.

Santa Catalina Iron-wood, Santa Cruz Iron-wood.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

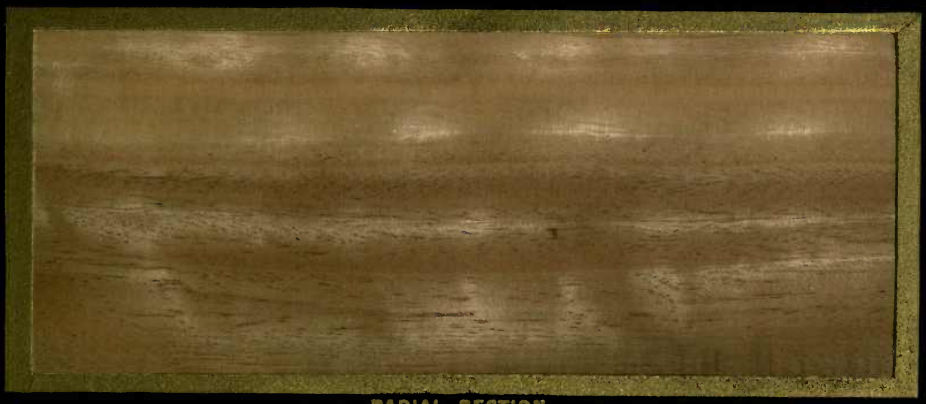
Ger. Eisenholtz von St. Catalina. *Fr.* Bois dur de St. Catalina.

Sp. Arbol de Hierro de Santa Catalina.

183. EUCALYPTUS GLOBULUS, Labill.

Eucalyptus, Blue Gum, Gum-tree.

TRANSVERSE SECTION.



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TANGENTIAL SECTION.

Ger. Eucalyptus. *Fr.* Eucalyptus. *Sp.* Eucalyptus.

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183. EUCALYPTUS GLOBULUS, Labill.

Eucalyptus, Blue Gum, Gum-tree.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Eucalyptus. *Fr.* Eucalyptus. *Sp.* Eucalyptus.

184. OPUNTIA TUNA, Mill.

Mission Cactus, Indian Fig, Prickly Pear.

TRANSVERSE SECTION

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Indische Feige. *Fr.* Figue d'Indien. *Sp.* Nopal.

Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. N., U. S. A.

184. OPUNTIA TUNA, Mill.

Mission Cactus, Indian Fig, Prickly Pear.

TRANSVERSE SECTION

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Indische Feige. *Fr.* Figue d'Indien. *Sp.* Nopal.

185. CORNUS NUTTALLII, Aud.

Western Dogwood, Flowering Dogwood.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Westlicher Hartriegel. *Fr.* Cornuiller occidental.

Sp. Cornel occidental.

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185. CORNUS NUTTALLII, Aud.

Western Dogwood, Flowering Dogwood.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Westlicher Hartriegel. *Fr.* Cornuiller occidental.

Sp. Cornel occidental.

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186. OLEA EUROPEA. L.

Olive.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Olivenholz. *Fr.* Olivier. *Sp.* Olivo.

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186. OLEA EUROPEA. L.

Olive.

TRANSVERSE SECTION.

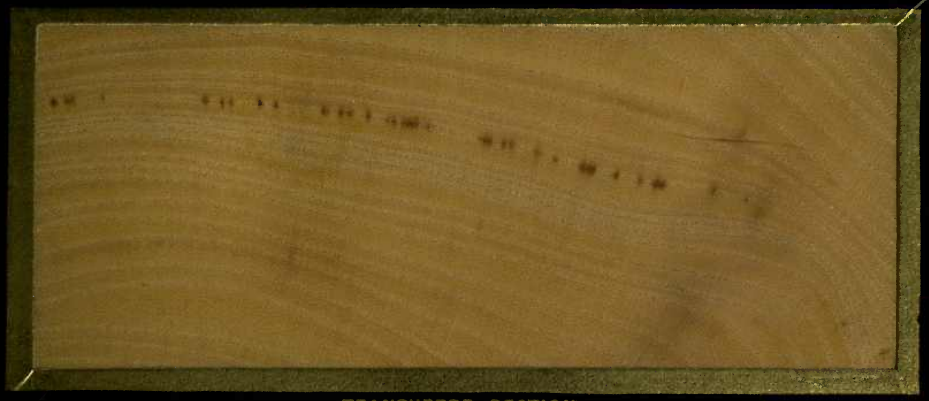
RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Olivenholz. *Fr.* Olivier. *Sp.* Olivo.

187. FRAXINUS OREGONA, Nutt.

Oregon Ash.



TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Oregonische Esche. *Fr.* Frêne d'Oregon.

Sp. Fresno de Oregon.

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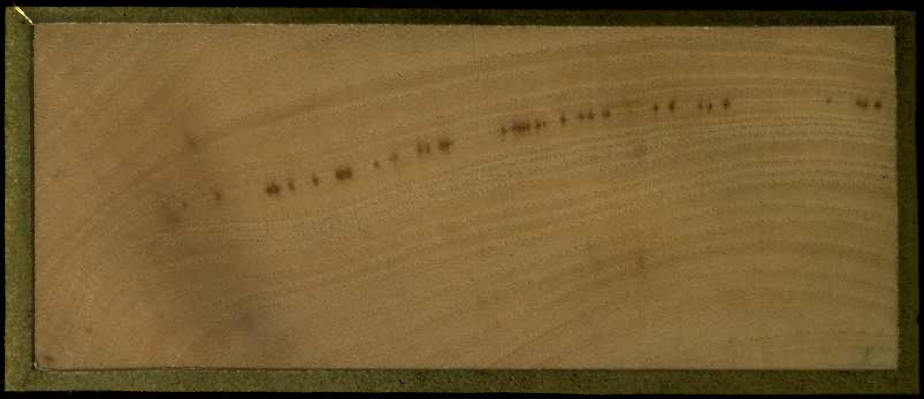
187. FRAXINUS OREGONA, Nutt.

Oregon Ash.



TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Oregonische Esche. *Fr.* Frêne d'Oregon.

Sp. Fresno de Oregon.

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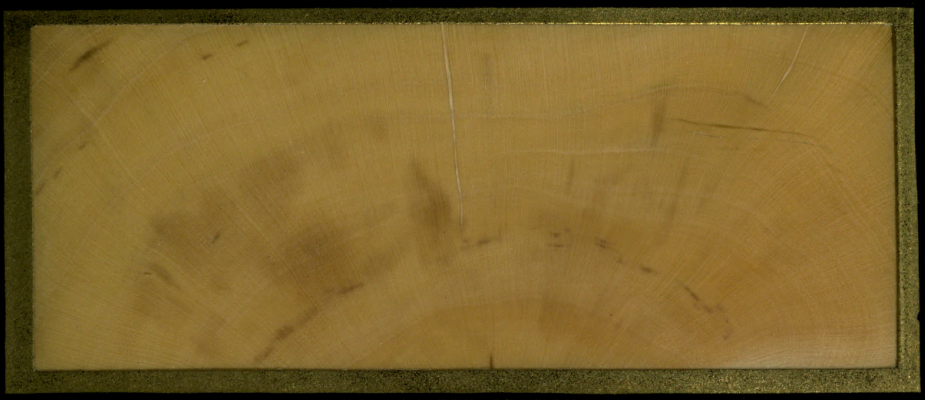
188. NICOTIANA GLAUCA, Grah.

Tree Tobacco, Wild Tobacco.



TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Baumischer Tabak. *Fr.* Tabac d'arbre.

Sp. Tabaco de Arbol.

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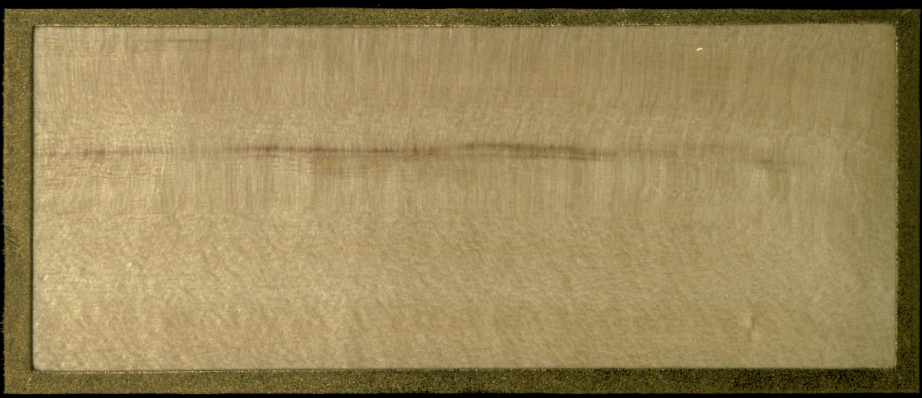
188. NICOTIANA GLAUCA, Grah.

Tree Tobacco, Wild Tobacco.

TRANSVERSE SECTION.



RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Baumischer Tabak. *Fr.* Tabac d'arbre.

Sp. Tabaco de Arbol.

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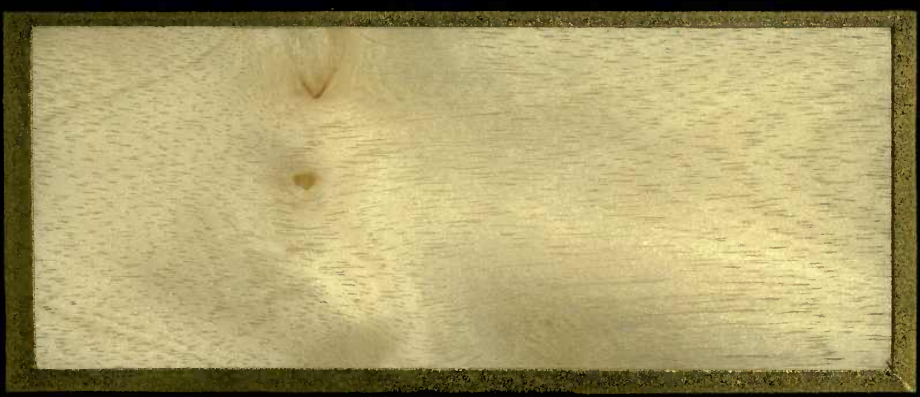
189. RICINUS COMMUNIS, L.

Castor-bean Tree, Palma Christi.

TRANSVERSE SECTION.

RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Ricinusbaum. *Fr.* Arbre de Ricin.

Sp. Arbol de Ricino.

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189. RICINUS COMMUNIS, L.

Castor-bean Tree, Palma Christi.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Ricinusbaum. *Fr.* Arbre de Ricin.

Sp. Arbol de Ricino.

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190. JUGLANS CALIFORNICA, Watson.

California Walnut.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Californische Wallnuszbaum. *Fr.* Noyer de Californie.

Sp. Nogal de California.

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190. JUGLANS CALIFORNICA, Watson.

California Walnut.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Californische Wallnuszbaum. *Fr.* Noyer de Californie.

Sp. Nogal de California.

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191. QUEUCUS TOMENTELLA, Engelm.

Island Live Oak, Santa Catalina White Oak.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Eiländische Stechpalme. *Fr.* Chêne vert insulaire.

Sp. Encina de isla.

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191. QUEUCUS TOMENTELLA, Engelm.

Island Live Oak, Santa Catalina White Oak.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Eiländische Stechpalme. *Fr.* Chêne vert insulaire.

Sp. Encina de isla.

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192. QUERCUS WISLIZENI, A. de C.

Highland Live Oak.

TRANSVERSE SECTION

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Hochländische Stechpalme. *Fr.* Chêne vert montagneux.

Sp. Encina montañesa.

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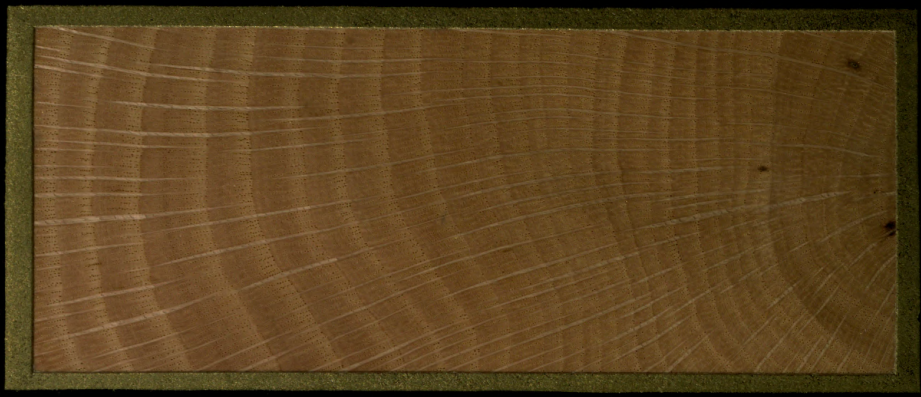
192. QUERCUS WISLIZENI, A. de C.

Highland Live Oak.



TRANSVERSE SECTION

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Hochländische Stechpalme. *Fr.* Chêne vert montagneux.

Sp. Encina montañesa.

Published and Sections made by Romeyn B. Hough, C. A., Lowville, N. Y., U. S. A.

193. SALIX NUTTALLII, Sarg.

Nuttall Willow.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Weide von Nuttall. *Fr.* Saule de Nuttall.

Sp. Sauce de Nuttall.

Published and Sections made by Romeyn B. Hough, S. A., Lowville, N. Y., U. S. A.

193. SALIX NUTTALLII, Sarg.

Nuttall Willow.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Weide von Nuttall. *Fr.* Saule de Nuttall.

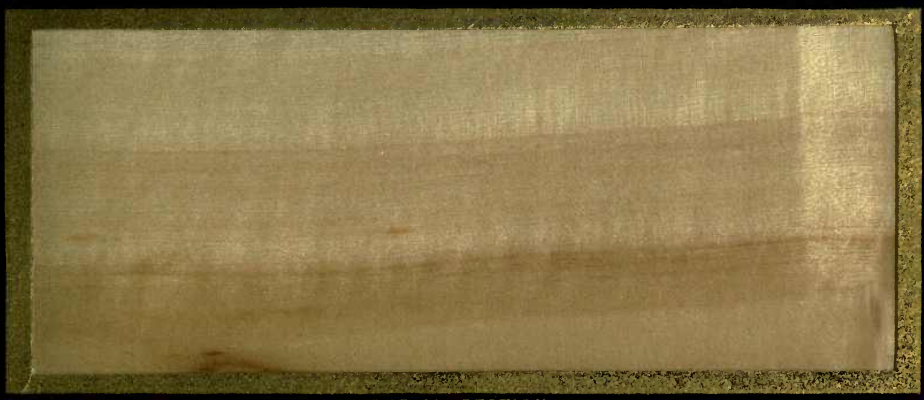
Sp. Sauce de Nuttall.

Published and Sections made by Romeyn B. Hough, S. A., Lowville, N. Y., U. S. A.

194. POPULUS FREMONTII, Wats.

White Cottonwood, Fremont Cottonwood.

TRANSVERSE SECTION



RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Pappel von Fremont. *Fr.* Peuplier de Fremont.

Sp. Alamo de Fremont.

Published and Sections made by Burleigh, B. J. Leigh, S. A., Lowville, N. Y., U. S. A.

194. POPULUS FREMONTII. Wats.

White Cottonwood, Fremont Cottonwood.

TRANSVERSE SECTION

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Pappel von Fremont. *Fr.* Peuplier de Fremont.

Sp. Alamo de Fremont.

Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.

195. CUPRESSUS MACROCARPA, Gord.

Monterey Cypress.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Cypresse von Monterey. *Fr.* Cypres de Monterey.

Sp. Cipres de Monterey.

Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.

195. CUPRESSUS MACROCARPA, Gord.

Monterey Cypress.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Cypresse von Monterey. *Fr.* Cypres de Monterey.

Sp. Cipres de Monterey.

Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.

196. PINUS MONOPHYLLA, Torr.

Single-leaf Piñon Pine, Nut Pine, Piñon.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Einzigblättrige Fichte. *Fr.* Pin monofeuillier.

Sp. Pino de mona hoja.

Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.

196. PINUS MONOPHYLLA, Torr.

Single-leaf Piñon Pine, Nut Pine, Piñon.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Einzigblättrige Fichte. *Fr.* Pin monofeuillier.

Sp. Pino de mona hoja.

Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.

197. PINUS TORREYANA, Parry.

Torrey Pine, Del Mar Pine, Soledad Pine.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Fichte von Torrey. *Fr.* Pin de Torrey.

Sp. Pino de Torrey.

Prepared and Sections made by Romeyn B. Hough, C. E., Lowville, N. Y., U. S. A.

197. PINUS TORREYANA, Parry.

Torrey Pine, Del Mar Pine, Soledad Pine.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Fichte von Torrey. *Fr.* Pin de Torrey.

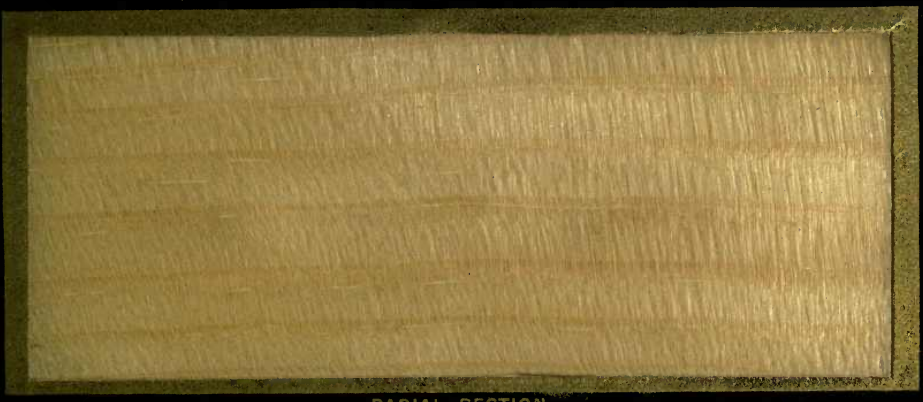
Sp. Pino de Torrey.

Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.

198. PINUS SABINIANA, Dougl.

Gray-leaf Pine, Digger Pine, Sabine Pine.

TRANSVERSE SECTION.



RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Graublättrige Fichte. *Fr.* Pin de feuilles gris.

Sp. Pino de hojas gris.

Published and Sections made by Rameyn B. Hough, B. A., Lowville, N. Y., U. S. A.

198. PINUS SABINIANA, Dougl.

Gray-leaf Pine, Digger Pine, Sabine Pine.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Graublättrige Fichte. *Fr.* Pin de feuilles gris.

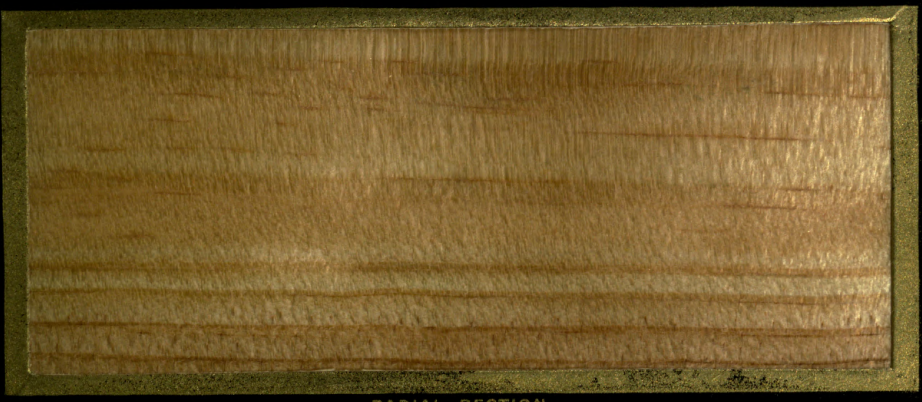
Sp. Pino de hojas gris.

Published and Sections made by Romeyn B. Hough, B.A., Lowville, N.Y.

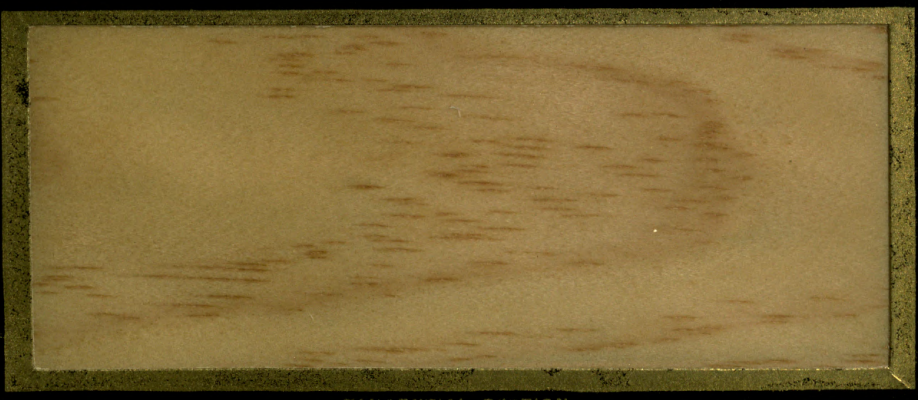
199. PINUS RADIATA, D. Don.

Monterey Pine.

TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Fichte von Monterey. *Fr.* Pin de Monterey.

Sp. Pino de Monterey.

Published by Forest Products Laboratory, Forest Service, U. S. Department of Agriculture, Madison, Wis., U. S. A.

199. PINUS RADIATA, D. Don.

Monterey Pine.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Fichte von Monterey. *Fr.* Pin de Monterey.

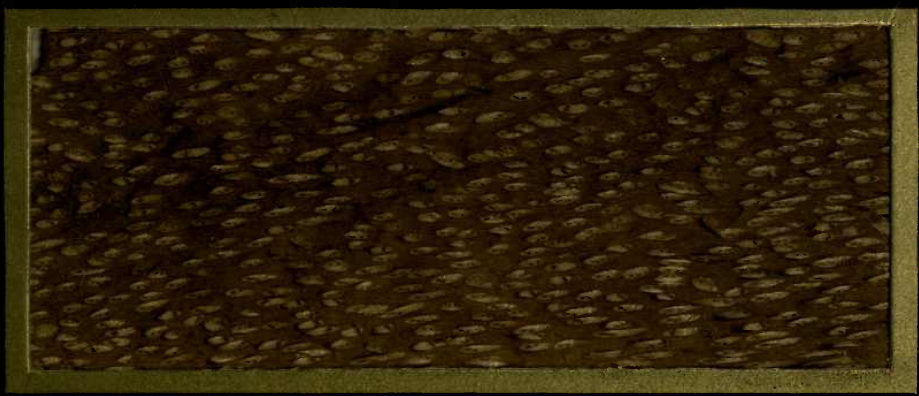
Sp. Pino de Monterey.

Published and Sections made by Romeyn B. Hough, S. A., Lowville, N. Y., U. S. A.

200. WASHINGTONIA FILAMENTOSA, O. K.

California Fan Palm, Desert Palm.

TRANSVERSE SECTION



RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Californianische Wedelpalme. *Fr.* Palmier d'eventail.

Sp. Palma de abanico.

200. WASHINGTONIA FILAMENTOSA, O. K.

California Fan Palm, Desert Palm.

TRANSVERSE SECTION

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Californianische Wedelpalme. *Fr.* Palmier d'eventail.

Sp. Palma de abanico.

Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.